THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF KINESIOLOGY

THE FUNCTIONAL USABILITY STUDY FOR THE ELDERLY (FUSE)

THE INDEPENDENT AND INTERRELATED EFFECTS OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR ON FUNCTIONAL AND QUALITY OF LIFE OUTCOMES IN OLDER ADULTS

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A thesis
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ABSTRACT

**Background**: The independent and synergistic effects of physical activity and sedentary behavior on function and quality of life outcomes in older adults remains understudied. Specifically, it is unclear whether sedentary behavior impacts function while controlling for physical activity levels. Additionally, few studies have examined the efficacy of comprehensive (in)activity counseling (relating physical activity and sedentary behavior to function) to short-term behavioral adaptations. The purpose of this investigation was to analyze these effects using objective (accelerometry) and subjective (self-report) methods of assessment. **Methods**: A sample of community-dwelling older adults (n= 61, mean age = 72.9, S.D. = 7.1) participated in a functional fitness test (objective function), completed baseline questionnaire measures (subjective function and quality of life), and wore an accelerometer for a period of 7 days to monitor physical activity and sedentary behavior trends. Associations between function and physical activity and sedentary behavior were evaluated using bivariate correlations and regression analysis. Following the 7-day baseline monitoring period, a subset of subjects with high levels of sedentary behavior (>8.0 hr/day) and below recommended levels of physical activity (<150 minutes of MVPA/week) were selected to wear an accelerometer for a period of 14 days after receiving either standard (control) or enhanced behavioral counseling (experimental). Between group differences were evaluated using paired sample t-tests. **Results**: Physical activity was significantly associated with function while controlling for sedentary behavior and sedentary behavior was not significantly associated with function while controlling for physical activity. Between-group
differences revealed no statistically significant changes in physical activity or sedentary behavior outcomes in either the control or experimental counseling groups. **Conclusion:**

These data suggest potential negative functional effects of sedentary behavior can be ameliorated by engaging in physical activity at recommended levels. Additionally, no added value is seen from receiving behavioral counseling enhanced by provision of personalized functional fitness feedback, although larger studies should corroborate these conclusions.

**Key words:** Physical activity, sedentary behavior, accelerometer.
# TABLE OF CONTENTS

List of Figures ................................................................................................................................. iii

List of Tables ................................................................................................................................. iv

Acknowledgements ........................................................................................................................... v

Chapter 1 Introduction .................................................................................................................... 1

Chapter 2 Methods .......................................................................................................................... 7

Chapter 3 Results ............................................................................................................................. 15

Chapter 4 Discussion ....................................................................................................................... 40

Chapter 5 Conclusion ....................................................................................................................... 48

References ......................................................................................................................................... 50

Appendix A. Pre-Experimental Recruitment Materials ................................................................. 54
  1. FuSE Participant Recruitment Letter ....................................................................................... 54
  2. Telephone Recruitment/Physical Activity Screening Script ................................................. 55
  3. FuSE Recruitment Flyer ........................................................................................................... 57
  4. APL Newsletter: FuSE Segment .............................................................................................. 58

Appendix B. Lab Visit I Experimental Materials ........................................................................... 59
  1. Informed Consent Form ........................................................................................................... 59
  2. Lab Visit I Recruited Participant Instruction Letter ................................................................ 62
  3. Lab Visit I Checklist ............................................................................................................... 65
  4. Senior Fitness Test Scorecard ................................................................................................ 66
  5. Activity Monitor Directions .................................................................................................... 67
  6. FuSE Comprehensive Questionnaire ...................................................................................... 69

Appendix C. Lab Visit II Experimental Materials ........................................................................... 90
  1. Lab Visit II Checklist .............................................................................................................. 90
  2. Feedback Script for Experimental and Control Groups ....................................................... 91
  3. Physical Activity Benefits & Barriers Fact Sheet ................................................................. 101
  4. Sedentary Behavior Fact Sheet ............................................................................................... 103
  5. Functional Outcomes Fact Sheet ........................................................................................... 104
  6. Control Group Feedback Report ............................................................................................ 105
LIST OF FIGURES

Figure 3.1 Pre- and Post-Intervention Average MVPA per day for Control Group .................. 30
Figure 3.2 Pre- and Post-Intervention Average MVPA per day for Experimental Group ............. 31
Figure 3.3 Pre-and Post-Intervention Total Physical Activity for Control Group ...................... 32
Figure 3.4 Pre- and Post-Intervention Total Physical Activity for Experimental Group ............. 33
Figure 3.5 Pre- and Post-Intervention Daily Average Sedentary Bouts for Control Group .......... 34
Figure 3.6 Pre-and Post-Intervention Daily Avg. Sedentary Bouts for Experimental Group ....... 35
Figure 3.7 Pre- and Post-Intervention Percent Sedentary Time for Control Group .................. 36
Figure 3.8 Pre- and Post-Intervention Percent Sedentary Time for Experimental Group .......... 37
Figure 3.9 Pre- and Post-Intervention Percent Time in Sedentary Bouts for Control Group ....... 38
Figure 3.10 Pre- and Post-Intervention Percent Time in Sed. Bouts for Experimental Group ...... 44
LIST OF TABLES

Table 2.1 The Senior Fitness Test Exercises and Functional Targets........................................10
Table 3.1 Demographic Variables and Sample Percentages..........................................................15
Table 3.2 Correlations between Physical Activity and Function/QOL Outcomes........................18
Table 3.3 Correlations between Sedentary Behavior and Function/QOL Measures..................19
Table 3.4 Between-Group Subjective Measures of Function and Quality of Life Differences....21
Table 3.5 Between-Group Objective Measures of Function Differences....................................22
Table 3.6 Predicting Self-Reported Function with Total Physical Activity...............................23
Table 3.7 Predicting Self-Reported Function with MVPA.........................................................23
Table 3.8 Predicting Arm Curl with Total Physical Activity.....................................................24
Table 3.9 Predicting Arm Curl with MVPA..................................................................................24
Table 3.10 Predicting Arm Curl with Sedentary Time.................................................................25
Table 3.11 Predicting 6-Minute Walk Test with Total Physical Activity......................................25
Table 3.12 Predicting 6-Minute Walk Test with MVPA...............................................................25
Table 3.13 Predicting 8 Foot Up-and-Go with Total Physical Activity.........................................26
Table 3.14 Predicting 8 Foot Up-and-Go with MVPA.................................................................26
Table 3.15 Predicting Sit-and-Reach with Total Physical Activity............................................26
Table 3.16 Predicting Back Scratch with Total Physical Activity................................................27
Table 3.17 Predicting Back Scratch with MVPA.........................................................................27
Table 3.18 Demographic Variables and Sample Percentages....................................................28
Table 3.19 Pre- and Post-Intervention Mean Physical Activity and Sed. Behavior Measures......29
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The research that follows, and the time and effort required to make this investigation a success, should not be viewed as the achievement of a single individual, rather that of a dedicated, industrious support system.

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Do or do not. There is no try
Chapter 1

Introduction: The “Use it or Lose it” Addendum for Older Adults

“Use it or lose it” has become such a universally accepted maxim in today’s fitness-minded culture that its validity is rarely questioned. Encompassing everything from maintaining muscle mass to conserving cognitive function, “use it or lose it” is deemed the silver bullet for the preservation of all-things human. In reality, the maxim, although far-reaching, is not all-encompassing, requiring a short addendum when considering its applicability to preventing functional deficits in older adults. Rather than “use it or lose it,” “use it or lose it faster” may more accurately reflect the reality of functional preservation for this population. For, whether older adults are using their bodies through physical activity, evidence shows a loss of function is still occurring (despite physical activity impeding the decline).\(^1\) While this trend may be related to the natural aging process (gradual decline in characteristics such as muscle mass,\(^1\) for example), recent research suggests sedentary behavior may also be contributing to functional and quality of life decline.\(^2-4\) A study by Dunlop et al. found the odds of self-reported disability in older adults were 46% greater for each daily hour spent sedentary, independent of physical activity.\(^2\) Additionally, research by Matthews et al. found positive associations between sedentary time and all-cause, cardiovascular, and cancer mortality regardless of activity levels.\(^3\) Similarly, a longitudinal study released by Katzmarzyk et al. found reducing excessive sedentary time to <3 h/day was associated
with a 2.00 year increase in life expectancy. With the exception of the Dunlop et al. study, the effects of a sedentary behavior on function has been largely understudied. With the number of adults over the age of 65 expected to double from 39.6 million in 2009 to 71 million by the year 2030, the need for understanding all facets of functional preservation is greater than ever before. The purpose of this investigation was to examine the independent and interrelated effects of physical activity and sedentary behavior on the preservation of function and quality of life in older adults.

In 2008 the United States federal government released the first comprehensive, evidence-based set of physical activity guidelines to the American public. Prior to this document’s instatement, controversy surrounding the proper mode, duration, and intensity of physical activity necessary to accrue health and functional benefits was common. The purpose of these guidelines was to combat this issue by providing a universal physical activity “prescription” for multiple age-defined divisions of the population, including older adults above the age of 65. Although the physical activity prescriptions vary by age group, all address two key sets of recommendations with respect to frequency, duration, and intensity of aerobic and muscle-strengthening activities.

For older adults (as well as the other age groups), the aerobic activity component of the guidelines, which is designed to enhance cardiovascular fitness, is divided into two modes: moderate and vigorous-intensity activity. Moderate-intensity physical activity is classified as any aerobic task requiring moderate exertion (approximately 3-6 metabolic equivalents) resulting in a noticeably accelerated heart rate (i.e. walking). Vigorous-intensity physical activity is defined as an activity requiring immense effort (>6
metabolic equivalents) and an obvious increase in heart and breathing rates (i.e. running). Older adults are encouraged to perform the same amount of aerobic activity as the adult population accumulating either 150 minutes (2 hours 30 minutes) of moderate-intensity activity, 75 minutes (1 hour 15 minutes) of vigorous-intensity activity, or an equivalent combination of the two (i.e. 100 minutes of moderate and 25 minutes of vigorous-intensity activity) per week. If older adults are unable to accrue the above levels of activity, due to the presence of chronic conditions, they are encouraged to be as physically active as their conditions will allow.

Following the same pattern as the aerobic component of the guidelines, the muscle-strengthening recommendations, which are designed to improve muscular fitness, are prescribed based on intensity and frequency. Muscle-strengthening activity is defined as any moderate to vigorous exercise requiring the use of all major muscle groups such as weight lifting, and body weight exercises. This component of the guidelines suggests older adults should perform muscle-strengthening activities stimulating all major muscle groups on two or more days per week as well as perform balance exercises if they are at risk for falling.

By attaining the above levels and modes of aerobic and muscle-strengthening activity, the 2008 Physical Activity Guidelines for Americans suggest older adults can reduce their risk for numerous life-threatening diseases/conditions including type II diabetes and cardiovascular disease, while experiencing enhanced function and quality of life. Despite these benefits, older adults remain the least active members of the population, with only 2-3% of them meeting the aerobic component (excluding the muscle-strengthening component) of the physical activity guidelines.
Although statistically the least active cohort, older adults show substantial diversity in physical fitness and their maintenance of functionality across the lifespan. Whereas some members of this population may exhibit physical abilities rivaling members of younger cohorts, others show substantial functional lapses, plagued with the inability to complete even simple everyday tasks. It has been previously hypothesized differences in physical activity levels could account for this trend. Recent research, however, suggests a more comprehensive explanation, highlighting a deleterious behavioral aspect of life the 2008 Physical Activity Guidelines for Americans fail to address: high levels of sedentary behavior.

In addition to being the least physically active members of the population, older adults also engage in the highest levels of sedentary behavior spending approximately 65% of their waking hours (9.54 hours per day) sitting. While the positive impacts of physical activity on function and quality of life have been studied extensively and are generally well-accepted (as evidenced by federally released guidelines urging Americans to be physically active), little attention is given to the effect of this sedentary trend. For example, research by Paterson et al. has shown short-term exercise programs with regular aerobic activity are associated with decreases in functional limitations and disability in older adults. Similarly, a longitudinal study conducted by Huang et al. following a cohort of older men for a period of 5.5 years found physically fit/active subjects exhibited less functional limitations than their inactive counterparts. Despite numerous studies detailing physical activity and functional correlations, it is unclear whether sufficient levels of physical activity offset or ameliorate the potential negative impact of sedentary behavior on function and quality of life. Additionally, it is unclear
whether adults meeting the recommended physical guidelines benefit significantly in terms of enhanced function and quality of life independent of their level of sedentary behavior.

The objective of this three-part investigation was to (1) evaluate levels of physical activity and sedentary behavior in a sample of older adults using objective (accelerometry) and subjective (self-report) methods of assessment, (2) assess the impact of both physical activity and sedentary behavior on functional and quality of life outcomes in this sample, and (3) determine (through a pilot intervention) whether the provision of functional fitness feedback, within the context of a brief physical (in)activity counseling intervention, is an effective method to increase physical activity and reduce sedentary behavior in older adults.

It was hypothesized physical activity and sedentary behavior would predict for function and quality of life outcomes independent of one another—meaning physical activity would predict for function and quality of life outcomes while controlling for sedentary behavior, and sedentary behavior would predict for these outcomes while controlling for physical activity. Additionally, the researcher hypothesized behavioral counseling enhanced by the provision of personalized functional fitness feedback would result in decreased sedentary/increased physical activity behavior. Given the potential health relevance of sedentary behavior for older adults, more data are needed to determine its impact on a range of outcomes including functional and quality of life measures. This study can objectively measure the impact of physical activity and sedentary behavior on these outcomes and determine whether brief manipulation through
the provision of personalized functional status feedback has the potential to temporarily change physical (in)activity patterns.
Chapter 2

Methods

Participants and Recruitment

The population of interest comprised older adults 60-85 years of age residing in central and south central Pennsylvania. Participants were recruited from an existing database of research volunteers, various community outlets frequenting older adults, and by personal referral. Telephone screening procedures were implemented to determine eligibility. To ensure representation of older adults across the physical activity spectrum (low active or sedentary to active and meeting the 2008 Physical Activity Guidelines) participants were screened on the basis of self-reported aerobic moderate and vigorous physical activity (MVPA). Additional eligibility criteria for prospective participants included: (1) being between the ages of 60-85, and (2) being capable of participating in normal physical activity (i.e. having no restrictions due to medical or health reasons). Subjects were excluded from participation if they failed to meet one or more of the above criteria, but not for any other reason (including the presence of chronic health conditions).

Based on self-reported physical activity levels at baseline, potential participants were categorized into one of three physical activity groups: high, moderate, or low activity. Individuals who reported accruing more than 150 minutes of aerobic physical activity per week were assigned to the “high activity” category, those reporting 30-60 minutes the “moderate activity” category, and 0-30 minutes “low activity.” The purpose of this initial telephone screening was to combat the non-response bias associated with
physical activity studies, with the objective of producing a sample with approximately a third of recruited participants in each of the three activity categories.

All procedures and proposed experimental designs were approved by the Institutional Review Board of the Pennsylvania State University (see Appendix B).

Participant recruitment began in September and closed in December of 2013.

**Study Procedures and Experimental Design**

This investigation took place in two phases. First, all subjects were asked to participate in one laboratory visit and complete a questionnaire assessing perceived physical activity, sedentary behavior, and a range of functional and quality of life outcomes (see Appendix B). During the first lab visit, participants also completed a battery of functional fitness tests to objectively measure physical function. Height and weight measurements were also collected using standardized laboratory procedures during this time. All study staff were trained in proper administration of the fitness tests and standard procedures were followed during test administration. Individual test performances were recorded on personalized scorecards and later converted to an electronic format (see Appendix B). At the end of this visit, subjects were instructed on the proper use of an accelerometer and were asked to wear the monitor on an elastic belt around their waist in line with the knee-cap of their non-dominant leg for a period of 7 days. The only time participants were permitted to remove the device was during bathing, sleeping, and water-related activities. As a means to validate wear time and weekly activity, subjects were required to complete a weekly log detailing their behavior. Following the monitoring period the accelerometers were returned to the Aging and Psychology Laboratory for data downloading and analysis.
The second phase of the study involved identifying participants with suboptimal levels of physical activity and sedentary behavior (as verified by baseline accelerometry data) and recruiting a sub-sample for a second lab visit which consisted of a personalized counseling session. Participant eligibility was limited to individuals meeting the following criteria: (1) spending more than 8 hours per day sedentary on average, and (2) engaging in less than 150 minutes of MVPA per week on average. Participants invited for the second lab visit were randomly assigned to one of two types of counseling feedback: (1) standard physical (in)activity counseling (control) and (2) enhanced physical (in)activity counseling (experimental). Standard physical (in)activity counseling consisted of physical activity, and sedentary behavior feedback from the 7-day baseline monitoring period as well as goal-setting (see Appendix C). Enhanced physical (in)activity counseling consisted of all the above sections with an additional functional feedback counseling portion. This component provided individuals with feedback on the functional fitness tests assessed during lab visit I, linking their performance to their physical activity and sedentary behavior trends. Following the counseling session, participants wore an activity monitor for an additional 14 day period.

Measures

*Objective Measures of Function.* The Senior Fitness Test\textsuperscript{13} was used to objectively measure physical function. The Senior Fitness Test was comprised of 6 exercises targeting different aspects of function. These exercises and their functional targets are displayed below in Table 2.1.
Table 2.1 The Senior Fitness Test Exercises and Functional Targets

<table>
<thead>
<tr>
<th>Exercise Test</th>
<th>Functional Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-Minute Walk</td>
<td>Aerobic Endurance</td>
</tr>
<tr>
<td>Chair Stand</td>
<td>Lower-Body Strength</td>
</tr>
<tr>
<td>Chair Sit-and-Reach</td>
<td>Lower-Body Flexibility</td>
</tr>
<tr>
<td>Arm Curl</td>
<td>Upper-Body Strength</td>
</tr>
<tr>
<td>Back Scratch</td>
<td>Upper-Body Flexibility</td>
</tr>
<tr>
<td>8-Foot Up-and-Go</td>
<td>Agility</td>
</tr>
</tbody>
</table>

*6-Minute Walk Test.* The 6-minute walk was used as a measure of aerobic endurance. This exercise took place on a 200 meter indoor track and measured the distance subjects could walk during a 6 minute period (measured in meters). Participants were asked to walk as fast as they felt comfortable without transitioning into running. If at any point participants felt as though they could no longer maintain their walking pace, they were advised to continue at a slower rate. The higher the score (in meters), the higher the functionality related to aerobic endurance.

*Chair Stand Test.* The chair stand test examined lower-body strength. This test measured how many standing-sitting cycles subjects could complete in a 30 second period. Participants began sitting with their arms crossed on their chest and were prompted when to begin their standing repetitions. Subjects were required to completely stand and sit in order for a repetition to be counted. The higher the score on this test, the better the function related to lower-body strength.

*Sit-and-Reach Test.* The sit-and-reach measured the distance (in centimeters) subjects could reach towards/past their toes with a straightened knee. Sitting on the edge
of a chair, participants had one leg bent and the other straight as they reached toward the foot of their straightened leg with both hands. Reaches falling short of the toes were recorded in negative centimeters, the toe was considered “0” centimeters, and reaches past the toes were recorded in positive centimeters. Each participant completed two trials of this test and only their best reach was used. The higher the score (in positive centimeters), the higher the functionality related to lower-body flexibility.

*Arm Curl Test.* The arm curl test was implemented to measure upper-body strength. This test measured how many bicep curls (arm curls) participants could complete in a 30 second period. Men were required to curl an 8 pound dumbbell while women curled a 5 pound dumbbell. Individuals unable to complete the test using the designated dumbbells could reduce the weight (i.e. men could use a 5 pound and women a 3 pound dumbbell) although their results could not be compared to others using the prescribed weights. The higher the score (the more arm curls), the higher the functionality related to upper-body strength.

*Back Scratch Test.* The back scratch test measured upper-body flexibility (specifically shoulder flexibility), by assessing the degree to which individuals could reach behind their backs. Participants selected their most flexible arm and reached over their head and down their back while their other arm reached behind and up their back in an attempt to link the two. The distance between the hands behind the back was measured as follows: fingertips that did not touch were measured in negative centimeters, fingertips that just touched were considered “0” centimeters, and fingertips that reached past one another were measured in positive centimeters. Each participant was granted two
attempts at this exercise and only their best reach was recorded. The higher the score (in positive centimeters), the higher the functionality related to lower-body flexibility.

*8 foot up-and-go.* The 8-foot up-and-go assessed the functional agility of participants. Individuals began the test seated exactly 8 feet away from a marker. When prompted, individuals would rise from the chair, walk as quickly as possible around either side of the cone, and then return to the seated position in the chair. Measurements were recorded based on how quickly individuals could complete this task. Each subject was allowed two attempts at this activity and only their fastest time was recorded. The lower the score (in seconds), the higher the functionality related to agility.

*Physical Activity and Sedentary Behavior.* Physical activity and sedentary behavior levels were measured objectively, using a tri-axial accelerometer (Actigraph Gt3x or Gt3x +). A day consisting of 10 or more valid hours of wear was considered a valid wear day. Periods of more than 90 minutes of consecutive zero counts were classified as non-wear intervals, attuned to recent recommendations.\(^\text{14}\) Data analysis was employed to determine total sedentary and moderate-vigorous physical activity (MVPA) time based on cutoff values proposed by Freedson et al.\(^\text{15}\) From these data, further measures were extrapolated including average daily sedentary time, average daily MVPA, and average length of sedentary bouts.

Additional self-report measures of physical activity and sedentary behavior were included as part of a baseline questionnaire. The Physical Activity Scale for the Elderly (PASE)\(^\text{16}\) was used to assess physical activity. The PASE survey was designed specifically for adults above the age of 65 and consists of a series of questions designed to detail current physical activity levels in various domains including work and household
activity. It is considered a valid instrument for measuring physical activity behavior of older adults. The Longitudinal Aging Study Amsterdam (LASA) Sedentary Behavior Questionnaire\textsuperscript{17} was used to assess sedentary behavior. The LASA 10-item survey was designed specifically for older adults to identify the quantity and mode of their sedentary behaviors during an average weekday. This survey is valid and reliable for measuring sedentary behavior of older adults.

\textit{Percieved Function Status and Quality of Life Measures.} The abbreviated Late Life Function and Disability Instrument (LL-FDI)\textsuperscript{18} was implemented to evaluate functionality related to activities of daily living. This questionnaire is designed to highlight key aspects of full-body function relating to everyday tasks. This instrument is valid and reliable for measuring functional outcomes in older adults. The Short-Form 12 (SF-12)\textsuperscript{19} was used as a measure of health-related quality of life. This questionnaire evaluates perceived health status, health limits, and physical, emotional, and social aspects of health. The SF-12 questionnaire provides two summary scores of perceived mental health (MHS) and physical health (PHS). This survey is a valid and reliable method of health evaluation frequently used in research on older adults. The Satisfaction with Life Scale (SWLS)\textsuperscript{20} was used as a measure of global quality of life. The SWLS is a 5-item survey measuring general judgments of life satisfaction. It is an instrument with good reliability and validity suitable for research with older adults.

\textbf{Statistical Analysis}

To evaluate the levels of physical activity and sedentary behavior using objective (accelerometry) and subjective (self-report) methods of assessment (specific aim 1), descriptive statistics (mean and standard deviation) were computed using SPSS version
and patterns were compared to data from a nationally represented sample from the NHANES study. To assess the impact of both physical activity and sedentary behavior on functional and quality of life outcomes (specific aim 2), first bivariate correlations were computed. Subsequently, participants were divided into active and inactive groups based on whether they met current physical activity guidelines and independent sample t-tests were used to compare between-group differences. Additionally, hierarchical regression analysis was conducted to evaluate independent effects of physical activity and sedentary behavior on functional and quality of life outcomes. Separate models were run to evaluate (1) the effects of physical activity on function and quality of life while controlling for sedentary behavior, and (2) the effects of sedentary behavior and function and quality of life while controlling for overall physical activity. To determine the efficacy of the behavioral counseling sessions on subsequent behavior (specific aim 3), paired sample t-tests were conducted to evaluate within group changes from pre- to post-intervention. Data from all 61 participants were included in the analysis although only 59 participants provided questionnaire data with sufficient information to be included (two participants had substantial portions of their questionnaires missing).
Chapter 3

Results

Community-dwelling older adults (N= 61) were recruited for participation in this investigation between September and December 2013. Of this sample 38 were women (62.3%) and 23 were men (37.7%). The mean age of participants was 72.9 with a standard deviation of 7.1 (72.9 ± 7.1). The sample was predominantly comprised of relatively healthy, white, married, well-educated, and above average income older adults. An overview of demographic characteristics of the sample is presented in Table 3.1.

Table 3.1 Demographic Variables and Sample Percentages

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Sample N</th>
<th>Portion of Sample (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample:</td>
<td>61</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Age:</strong> Mean = 72.9 ± 7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td>21</td>
<td>34.4</td>
</tr>
<tr>
<td>70-79</td>
<td>29</td>
<td>47.5</td>
</tr>
<tr>
<td>80+</td>
<td>11</td>
<td>18.0</td>
</tr>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>23</td>
<td>37.7</td>
</tr>
<tr>
<td>Women</td>
<td>38</td>
<td>62.3</td>
</tr>
<tr>
<td><strong>Employment Status:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>21</td>
<td>34.4</td>
</tr>
<tr>
<td>Retired</td>
<td>35</td>
<td>57.3</td>
</tr>
<tr>
<td>Unemployed</td>
<td>2</td>
<td>3.28</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>4.92</td>
</tr>
<tr>
<td><strong>Marital Status:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single, Never Married</td>
<td>1</td>
<td>1.60</td>
</tr>
<tr>
<td>Married/Domestic Partnership</td>
<td>39</td>
<td>63.9</td>
</tr>
<tr>
<td>Widowed</td>
<td>14</td>
<td>23.0</td>
</tr>
<tr>
<td>Divorced</td>
<td>5</td>
<td>8.20</td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School Graduate</td>
<td>4</td>
<td>6.60</td>
</tr>
<tr>
<td>Some College, No Degree</td>
<td>5</td>
<td>8.20</td>
</tr>
<tr>
<td>Trade/Technical Training</td>
<td>3</td>
<td>4.90</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>15</td>
<td>24.6</td>
</tr>
</tbody>
</table>
Specific Aim 1: Evaluating Physical Activity and Sedentary Behavior Trends in a Sample of Older Adults

To evaluate specific aim 1, mean objective physical activity and sedentary behavior measures were calculated from accelerometer data. Over the 7 day baseline monitoring period, the mean daily wear time of the 61 participants was 14.2 hours/day. Average MVPA per day was 14.7 minutes with 55.7% of subjects accruing less than 10 minutes/day. Of the 61 participants, 24.6% met the current aerobic component of the physical activity guidelines. Average time in sedentary bouts was 3483.02 minutes/day (8.29 hours/day), with 36.4% sitting for more than 9.0 hours/day (excluding periods of non-wear).
Specific Aim 2: Evaluating the Effects of Physical Activity and Sedentary Behavior on Functional and Quality of Life Outcomes

To address specific aim 2, bivariate correlations between physical activity and sedentary behavior and function and quality of life outcomes were computed (see Tables 3.2 and 3.3). In general, the pattern of correlations supports the expected relationships. Objectively measured physical activity was significantly associated with functional outcomes in the expected directions. More physically active participants reported and performed better on measures of function. No statistically significant associations were found between self-reported physical activity and function or between self-reported and objectively measured physical activity and quality of life measures (see Table 3.2).

Self-reported sedentary behavior was significantly associated only with upper extremity function. This means those engaging in more sedentary behavior reported enhanced upper-extremity function. Objectively measured sedentary behavior was positively associated with the arm curl (functional output) and the mental health score (quality of life outcome) and negatively associated with the 8 foot up-and-go. That is, individuals reporting higher sedentary behavior performed more arm curl repetitions, reported better mental health, and had lower (faster) 8 foot up-and-go times (see Table 3.3).
Table 3.2 Correlations between Physical Activity and Function/QOL Outcomes

<table>
<thead>
<tr>
<th></th>
<th>PASE</th>
<th>Avg. MVPA/Day</th>
<th>Axis 1 CPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Lower Extremity Function</td>
<td>-0.220</td>
<td>-0.376**</td>
<td>-0.409**</td>
</tr>
<tr>
<td>Advanced Lower Extremity Function</td>
<td>-0.161</td>
<td>-0.488**</td>
<td>-0.499**</td>
</tr>
<tr>
<td>Upper Extremity Function</td>
<td>-0.160</td>
<td>-0.015</td>
<td>0.028</td>
</tr>
<tr>
<td>Total Function Score</td>
<td>-0.228</td>
<td>-0.418**</td>
<td>-0.414**</td>
</tr>
<tr>
<td>Arm Curl</td>
<td>0.081</td>
<td>0.362**</td>
<td>0.306*</td>
</tr>
<tr>
<td>Chair Stand</td>
<td>-0.096</td>
<td>0.051</td>
<td>0.120</td>
</tr>
<tr>
<td>6 Minute Walk</td>
<td>0.233</td>
<td>0.445**</td>
<td>0.450**</td>
</tr>
<tr>
<td>8 ft. up and Go</td>
<td>-0.179</td>
<td>-0.422**</td>
<td>-0.441**</td>
</tr>
<tr>
<td>Sit and Reach (cm)</td>
<td>0.062</td>
<td>0.314*</td>
<td>0.318*</td>
</tr>
<tr>
<td>Back Scratch (cm)</td>
<td>0.007</td>
<td>0.376**</td>
<td>0.374**</td>
</tr>
<tr>
<td>SF-12 Physical Health Score</td>
<td>-0.75</td>
<td>0.157</td>
<td>0.158</td>
</tr>
<tr>
<td>SF-12 Mental Health Score</td>
<td>-0.010</td>
<td>-0.023</td>
<td>0.023</td>
</tr>
<tr>
<td>Satisfaction with Life</td>
<td>0.088</td>
<td>-0.142</td>
<td>-0.098</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*.  Correlation is significant at the 0.05 level (2-tailed).
Table 3.3 Correlations between Sedentary Behavior and Function/QOL Measures

<table>
<thead>
<tr>
<th>Functional Measures</th>
<th>Self-Reported Sedentary Behavior (minutes)</th>
<th>Total Sedentary Time (Objective)</th>
<th>Total Sedentary Bouts</th>
<th>Total Time in Sedentary Bouts</th>
<th>Average Length of Sedentary Bouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Lower Extremity Function</td>
<td>0.040</td>
<td>0.038</td>
<td>-0.069</td>
<td>0.168</td>
<td>0.362**</td>
</tr>
<tr>
<td>Advanced Lower Extremity Function</td>
<td>0.027</td>
<td>0.104</td>
<td>0.018</td>
<td>0.206</td>
<td>0.265*</td>
</tr>
<tr>
<td>Upper Extremity Function</td>
<td>-0.285*</td>
<td>-0.233</td>
<td>-0.171</td>
<td>-0.228</td>
<td>-0.185</td>
</tr>
<tr>
<td>Total Function Score</td>
<td>-0.101</td>
<td>-0.026</td>
<td>-0.079</td>
<td>0.073</td>
<td>0.174</td>
</tr>
<tr>
<td>Arm Curl</td>
<td>-0.122</td>
<td>0.291*</td>
<td>0.281*</td>
<td>0.239</td>
<td>0.025</td>
</tr>
<tr>
<td>Chair Stand</td>
<td>-0.161</td>
<td>0.193</td>
<td>0.247</td>
<td>0.085</td>
<td>-0.237</td>
</tr>
<tr>
<td>6 Min. Walk</td>
<td>-0.235</td>
<td>0.240</td>
<td>0.232</td>
<td>0.111</td>
<td>-0.187</td>
</tr>
<tr>
<td>8 Ft. up-n-go</td>
<td>0.232</td>
<td>-0.311*</td>
<td>-0.385**</td>
<td>-0.163</td>
<td>0.321*</td>
</tr>
<tr>
<td>Sit and Reach (cm)</td>
<td>-0.157</td>
<td>0.246</td>
<td>0.274*</td>
<td>0.144</td>
<td>-0.211</td>
</tr>
<tr>
<td>Back Scratch</td>
<td>-0.162</td>
<td>0.188</td>
<td>0.092</td>
<td>0.106</td>
<td>0.015</td>
</tr>
</tbody>
</table>
To evaluate between group differences in function and quality of life of individuals meeting physical activity guidelines and those not meeting physical activity guidelines independent sample t-tests were used. Tables 3.4 and 3.5 below present the mean differences between the groups on subjective (Table 3.4) and objective (Table 3.5) measures of function and quality of life. Statistically significant differences between the groups were observed relative to basic lower extremity function (t_{57} = 2.511, p<0.05), advanced lower extremity function (t_{57} = 2.511, p<0.05), total function score (t_{57} = 2.23, p < 0.05), upper-body strength as measured by the arm curl test (t_{59} = -2.434, p < 0.05), aerobic endurance as measured by the 6-minute walk test (t_{59} = -3.049, p < 0.05), functional agility as measured by the 8 foot up-and-go (t_{59} = 3.054, p < 0.05), lower-body flexibility as measured by the sit-and-reach test (t_{59} = -2.460, p < 0.05), and upper-body flexibility as measured by the back scratch test (t_{59} = -2.882, p < 0.05). Individuals

<table>
<thead>
<tr>
<th>Quality of Life Measures</th>
<th>Self-Reported Sedentary Behavior (minutes)</th>
<th>Total Sedentary Time (Objective)</th>
<th>Total Sedentary Bouts</th>
<th>Total Time in Sedentary Bouts</th>
<th>Average Length of Sedentary Bouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-12 Physical Health Score</td>
<td>-0.144</td>
<td>-0.110</td>
<td>-0.152</td>
<td>-0.139</td>
<td>0.001</td>
</tr>
<tr>
<td>SF-12 Mental Health Score</td>
<td>-0.007</td>
<td>0.388**</td>
<td>0.446**</td>
<td>0.343**</td>
<td>-0.104</td>
</tr>
<tr>
<td>Satisfaction with Life</td>
<td>0.168</td>
<td>-0.009</td>
<td>0.066</td>
<td>-0.014</td>
<td>-0.086</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
meeting guidelines reported less difficulty with basic and advanced lower extremity function and performed better on the listed functional tests.

**Table 3.4** Between-Group Subjective Measures of Function and Quality of Life Differences

<table>
<thead>
<tr>
<th></th>
<th>Sample N</th>
<th>Mean</th>
<th>Stand. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Lower -Extremity Function</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>6.05</td>
<td>1.26</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>5.20</td>
<td>0.561</td>
</tr>
<tr>
<td><strong>Advanced Lower Extremity Function</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>10.9</td>
<td>3.86</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>7.87</td>
<td>2.00</td>
</tr>
<tr>
<td><strong>Upper -Extremity Function</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>7.77</td>
<td>2.56</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>8.13</td>
<td>2.23</td>
</tr>
<tr>
<td><strong>Total Function Score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>24.7</td>
<td>5.86</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>21.2</td>
<td>3.00</td>
</tr>
<tr>
<td><strong>SF-12 Physical Health Score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>39.3</td>
<td>5.94</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>41.5</td>
<td>6.05</td>
</tr>
<tr>
<td><strong>SF-12 Mental Health Score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>60.5</td>
<td>5.98</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>60.9</td>
<td>6.09</td>
</tr>
<tr>
<td><strong>Satisfaction with Life</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>44</td>
<td>5.73</td>
<td>0.870</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td>15</td>
<td>5.37</td>
<td>0.962</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).
Table 3.5 Between-Group Objective Measures of Function Differences

<table>
<thead>
<tr>
<th>SFT Variable</th>
<th>Sample N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Arm Curl (No. Curls)</td>
<td>46</td>
<td>17.2</td>
<td>4.65</td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>15</td>
<td>20.7</td>
<td>5.47</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chair Stand (No. Stands)</td>
<td>46</td>
<td>13.6</td>
<td>4.45</td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>15</td>
<td>14.1</td>
<td>4.32</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*6 Minute Walk (m)</td>
<td>45</td>
<td>558</td>
<td>88.1</td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>15</td>
<td>637</td>
<td>81.6</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*8 ft. Up-N-Go (sec)</td>
<td>46</td>
<td>6.45</td>
<td>1.53</td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>15</td>
<td>5.08</td>
<td>1.45</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Sit and Reach (cm)</td>
<td>46</td>
<td>1.10</td>
<td>9.28</td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>15</td>
<td>8.38</td>
<td>11.9</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Back Scratch (cm)</td>
<td>46</td>
<td>-9.47</td>
<td>11.3</td>
</tr>
<tr>
<td>Below Guidelines</td>
<td>15</td>
<td>0.041</td>
<td>10.3</td>
</tr>
<tr>
<td>Meeting Guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).

To evaluate the extent to which levels of physical activity and sedentary behavior predicted functional and quality of life outcomes, a series of hierarchical regression analyses were performed. Each model controlled for accelerometer valid wear time. First sets of models predicted individual functional outcomes based on objectively measured physical activity (total and MVPA) while controlling for total sedentary behavior. The next set of models predicted individual functional outcomes based on objectively measured sedentary behavior while controlling for overall physical activity. Only the regression analyses with statistically significant findings are reported. Only functional outcomes were predicted given the lack of significant correlations between physical activity and sedentary behavior and the quality of life measures.
In terms of self-reported function (total function score), total physical activity ($F_{1,55} = 4.621$, $R^2_{\text{change}} = 0.07$, $p < 0.05$), and MVPA ($F_{1,55} = 5.535$, $R^2_{\text{change}} = 0.082$, $p < 0.05$) both explained a significant amount of variance in self-reported function after accounting for the effects of total sedentary time, however, total sedentary time did not predict self-reported function once controlling for physical activity (either total of MVPA).

Table 3.6 Predicting Self-Reported Function with Total Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R Square</td>
</tr>
<tr>
<td>1</td>
<td>.320*</td>
<td>.102</td>
<td>.070</td>
<td>5.28200</td>
<td>.102</td>
</tr>
<tr>
<td>2</td>
<td>.415*</td>
<td>.172</td>
<td>.127</td>
<td>5.11910</td>
<td>.070</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time
b. Predictors: (Constant), Sedentary, Time, Axis 1 Counts

Table 3.7 Predicting Self-Reported Function with MVPA

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R Square</td>
</tr>
<tr>
<td>1</td>
<td>.320*</td>
<td>.102</td>
<td>.070</td>
<td>5.28200</td>
<td>.102</td>
</tr>
<tr>
<td>2</td>
<td>.429*</td>
<td>.184</td>
<td>.140</td>
<td>5.08028</td>
<td>.082</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time
b. Predictors: (Constant), Sedentary, Time, Total MVPA

The pattern of results was similar when predicting individual functional fitness tests. Physical activity (total and MVPA) explained significant amount of variance in all
aspects of function except for lower body strength (chair stand test) (see Tables 3.8-3.17) while controlling for sedentary behavior (MVPA predicted lower body flexibility only marginally p=0.052, data not depicted). The amount of unique variance explained in functional outcomes ranged from 6-14%.

Sedentary behavior did not predict any functional outcome once accounting for the effects of physical activity (total or MVPA).

**Table 3.8 Predicting Arm Curl with Total Physical Activity**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.344</td>
<td>.118</td>
<td>0.086</td>
<td>4.824</td>
<td>.118</td>
<td>3.889</td>
<td>2</td>
<td>58</td>
<td>.026</td>
</tr>
<tr>
<td>2</td>
<td>.497</td>
<td>.247</td>
<td>0.208</td>
<td>4.497</td>
<td>.129</td>
<td>9.760</td>
<td>1</td>
<td>57</td>
<td>.003</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time
b. Predictors: (Constant), Sedentary, Time, Axis 1 Counts

**Table 3.9 Predicting Arm Curl with MVPA**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.344</td>
<td>.118</td>
<td>0.088</td>
<td>4.824</td>
<td>.118</td>
<td>3.889</td>
<td>2</td>
<td>58</td>
<td>.026</td>
</tr>
<tr>
<td>2</td>
<td>.474</td>
<td>.225</td>
<td>0.184</td>
<td>4.563</td>
<td>.107</td>
<td>7.850</td>
<td>1</td>
<td>57</td>
<td>.007</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time
b. Predictors: (Constant), Sedentary, Time, Total MVPA
**Table 3.10** Predicting Arm Curl with Sedentary Time

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>.426a</td>
<td>.183</td>
<td>.155</td>
<td>4.644</td>
<td>.183 6.492</td>
</tr>
<tr>
<td>2</td>
<td>.497b</td>
<td>.247</td>
<td>.208</td>
<td>4.497</td>
<td>.064 4.864</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Axis 1 Counts, Time
b. Predictors: (Constant), Axis 1 Counts, Time, Sedentary

**Table 3.11** Predicting 6-Minute Walk Test with Total Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.451a</td>
<td>.203</td>
<td>.175</td>
<td>83.9460</td>
<td>.203 7.267</td>
</tr>
<tr>
<td>2</td>
<td>.542b</td>
<td>.294</td>
<td>.256</td>
<td>79.7437</td>
<td>.090 7.166</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time
b. Predictors: (Constant), Sedentary, Time, Axis 1 Counts

**Table 3.12** Predicting 6-Minute Walk Test with MVPA

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.451a</td>
<td>.203</td>
<td>.175</td>
<td>83.9460</td>
<td>.203 7.267</td>
</tr>
<tr>
<td>2</td>
<td>.546b</td>
<td>.298</td>
<td>.261</td>
<td>79.4733</td>
<td>.095 7.596</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time
b. Predictors: (Constant), Sedentary, Time, Total MVPA
### Table 3.13 Predicting 8 Foot Up-and-Go with Total Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.518*</td>
<td>.269</td>
<td>.243</td>
<td>1.4045224</td>
<td>.269</td>
<td>10.646</td>
<td>2</td>
<td>58</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.592*</td>
<td>.351</td>
<td>.316</td>
<td>1.3349698</td>
<td>.082</td>
<td>7.201</td>
<td>1</td>
<td>57</td>
<td>.010</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time  
b. Predictors: (Constant), Sedentary, Time, Axis 1 Counts

### Table 3.14 Predicting 8 Foot Up-and-Go with MVPA

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.518*</td>
<td>.269</td>
<td>.243</td>
<td>1.4045224</td>
<td>.269</td>
<td>10.646</td>
<td>2</td>
<td>58</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.588*</td>
<td>.346</td>
<td>.312</td>
<td>1.3395172</td>
<td>.078</td>
<td>6.766</td>
<td>1</td>
<td>57</td>
<td>.012</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time  
b. Predictors: (Constant), Sedentary, Time, Total MVPA

### Table 3.15 Predicting Sit-and-Reach with Total Physical Activity

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.385*</td>
<td>.148</td>
<td>.119</td>
<td>9.7381509</td>
<td>.148</td>
<td>5.041</td>
<td>2</td>
<td>58</td>
<td>.010</td>
</tr>
<tr>
<td>2</td>
<td>.469*</td>
<td>.220</td>
<td>.179</td>
<td>9.3987030</td>
<td>.072</td>
<td>5.265</td>
<td>1</td>
<td>57</td>
<td>.025</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Sedentary, Time  
b. Predictors: (Constant), Sedentary, Time, Axis 1 Counts
Table 3.16 Predicting Back Scratch with Total Physical Activity

![Model Summary Table]

Table 3.17 Predicting Back Scratch with MVPA

![Model Summary Table]

Experimental Counseling

Of the initial sample, 13 subjects (21.3%) were recruited for participation in the pilot intervention component of this investigation. The mean weekly sedentary time and MVPA of this sample during the 7 day monitoring period was 3862.8 min/week (9.20 hr/day) and 69.3 min/week (9.90 min/day) respectively. An overview of demographic characteristics of this sub-set is presented in Table 3.18.
Table 3.18 Demographic Variables and Sample Percentages

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Sample N</th>
<th>Portion of Sample (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample:</td>
<td>13</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Age:</strong> Mean = 72.9 ± 7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td>4</td>
<td>30.8</td>
</tr>
<tr>
<td>70-79</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>5</td>
<td>38.4</td>
</tr>
<tr>
<td>Women</td>
<td>8</td>
<td>61.5</td>
</tr>
<tr>
<td><strong>Employment Status:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working</td>
<td>7</td>
<td>53.8</td>
</tr>
<tr>
<td>Retired</td>
<td>5</td>
<td>38.4</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1</td>
<td>7.70</td>
</tr>
<tr>
<td><strong>Marital Status:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/Domestic Partnership</td>
<td>11</td>
<td>84.6</td>
</tr>
<tr>
<td>Widowed</td>
<td>2</td>
<td>15.4</td>
</tr>
<tr>
<td><strong>Education:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School Graduate</td>
<td>1</td>
<td>7.70</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>3</td>
<td>23.1</td>
</tr>
<tr>
<td>Master’s Degree</td>
<td>5</td>
<td>38.5</td>
</tr>
<tr>
<td>Doctorate Degree</td>
<td>4</td>
<td>30.8</td>
</tr>
<tr>
<td><strong>Annual Income:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$25,001-$40,000</td>
<td>1</td>
<td>7.70</td>
</tr>
<tr>
<td>$40,001-$65,000</td>
<td>2</td>
<td>15.4</td>
</tr>
<tr>
<td>$65,001 or more</td>
<td>10</td>
<td>76.9</td>
</tr>
<tr>
<td><strong>Race:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>12</td>
<td>92.3</td>
</tr>
<tr>
<td>Black/African American</td>
<td>1</td>
<td>7.70</td>
</tr>
<tr>
<td><strong>Ethnicity:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Hispanic or Latino</td>
<td>13</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Following randomization, 7 subjects were assigned to the experimental and 6 the control group. Given the small sample size, changes from pre- to post-intervention were evaluated within each group using paired sample t-tests. Table 3.19 presents the mean level of change in physical activity and sedentary behavior measures from pre- to post-intervention within each group. There were no statistically significant changes in either group for physical activity or sedentary behavior.
Table 3.19 Pre- and Post-Intervention Mean Physical Activity and Sedentary Behavior Measures

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
<th>Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average MVPA per Day</strong> (mins)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>12.7</td>
<td>22.7</td>
<td>+10.0</td>
</tr>
<tr>
<td>Control</td>
<td>7.1</td>
<td>15.8</td>
<td>+8.70</td>
</tr>
<tr>
<td><strong>Total Physical Activity</strong> (Counts/Min)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>181.8</td>
<td>214.5</td>
<td>+32.7</td>
</tr>
<tr>
<td>Control</td>
<td>132.7</td>
<td>172.4</td>
<td>+39.7</td>
</tr>
<tr>
<td><strong>Daily Avg. Sedentary Bouts</strong> (mins)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>519.5</td>
<td>491.8</td>
<td>-27.7</td>
</tr>
<tr>
<td>Control</td>
<td>542.9</td>
<td>512.9</td>
<td>-30.0</td>
</tr>
<tr>
<td><strong>% Time in Sedentary Min.</strong> (mins)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>73.7</td>
<td>77.6</td>
<td>+3.90</td>
</tr>
<tr>
<td>Control</td>
<td>77.5</td>
<td>77.7</td>
<td>+0.20</td>
</tr>
<tr>
<td><strong>% Time in Sedentary Bouts</strong> (mins)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>60.0</td>
<td>59.9</td>
<td>-0.10</td>
</tr>
<tr>
<td>Control</td>
<td>65.2</td>
<td>59.2</td>
<td>-6.00</td>
</tr>
</tbody>
</table>

Although both experimental and control groups showed increases in their average daily MVPA (+10.0 and +8.70 mins/day respectively) and total physical activity, these were not statistically significant. When considering sedentary behavior variables, both experimental and control groups reduced their number of sedentary bouts slightly, but these changes were not statistically significant.
The following two figures (Figure 3.1 and Figure 3.2) display individual changes between pre- and post-intervention MVPA for control (Figure 3.1) and experimental (Figure 3.2) group members.

**Figure 3.1** Pre- and Post-Intervention Average MVPA per day for Control Group

Of the 6 control subjects, all but 2 (subjects 1 & 2) showed increases in their average daily MVPA. Additionally, 2 participants (subjects 3 & 5) increased their physical activity to levels at or above the aerobic component of the 2008 Physical Activity Guidelines for Americans, accruing 150 minutes (or more) of physical activity per week. Changes in mean MVPA/day were not statistically significant pre- to post-intervention.
Figure 3.2 Pre- and Post-Intervention Average MVPA per day for Experimental Group

Of the 7 experimental subjects, all but 3 (subjects 1, 2, & 7) showed increases in their average daily MVPA. Additionally, 4 participants (subjects 3, 4, 5, & 6) increased their physical activity to levels at or above the aerobic component of the 2008 Physical Activity Guidelines for Americans, accruing 150 minutes (or more) of physical activity per week. Changes in mean MVPA/day were not statistically significant pre- to post-intervention.
The following two figures (Figure 3.3 and Figure 3.4) display individual changes between pre- and post-intervention average total physical activity for control (Figure 3.3) and experimental (Figure 3.4) group members.

**Figure 3.3 Pre- and Post-Intervention Average Total Physical Activity for Control Group**

Of the 6 control subjects, 3 (subjects 3, 5, and 6) showed increases in their total physical activity. Although the mean total physical activity of this group increased by 39.7 CPM pre- to post-intervention, this change was not statistically significant.
Of the 7 control subjects, 3 (subjects 3, 5, and 6) showed increases in their total physical activity. Although the mean total physical activity of this group increased by 32.7 CPM pre- to post-intervention, this change was not statistically significant.
The following two figures (Figure 3.5 and Figure 3.6) display individual changes between pre- and post-intervention daily average sedentary bouts for control (Figure 3.5) and experimental (Figure 3.6) group members.

**Figure 3.5** Pre- and Post-Intervention Daily Average Sedentary Bouts for Control Group

<table>
<thead>
<tr>
<th>Control Subject (n=6)</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>537.2</td>
<td>407.9</td>
</tr>
<tr>
<td>2</td>
<td>575</td>
<td>625.6</td>
</tr>
<tr>
<td>3</td>
<td>681.9</td>
<td>627.7</td>
</tr>
<tr>
<td>4</td>
<td>552.1</td>
<td>553.8</td>
</tr>
<tr>
<td>5</td>
<td>470.3</td>
<td>244.8</td>
</tr>
<tr>
<td>6</td>
<td>441</td>
<td>617.5</td>
</tr>
</tbody>
</table>

Of the 6 control subjects, 3 (subjects 1, 3, and 5) showed reductions in their daily average number of sedentary bouts. Although the mean average number of sedentary bouts decreased by 30.0 counts/day, this change was not statistically significant.
Of the 7 control subjects, 3 (subjects 3, 5, and 6) showed reductions in their daily average number of sedentary bouts. Although the mean average number of sedentary bouts decreased by 27.7 counts/day, this change was not statistically significant.
The following two figures (Figure 3.7 and Figure 3.8) display individual differences between pre- and post-intervention percent time sedentary for control (Figure 3.7) and experimental (Figure 3.8) group members.

**Figure 3.7** Pre- and Post-Intervention Percent Sedentary Time for Control Group

<table>
<thead>
<tr>
<th>Control Subject (n=6)</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>68</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
<td>82</td>
</tr>
<tr>
<td>3</td>
<td>83</td>
<td>78</td>
</tr>
<tr>
<td>4</td>
<td>77</td>
<td>79</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
<td>81</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>78</td>
</tr>
</tbody>
</table>

Of the 6 control subjects, 3 (subjects 1, 3, and 6) showed reductions in their percent time sedentary. From pre- to post-intervention the mean percent time sedentary remained constant (77.6 pre- and 77.7 post-intervention), resulting in no statistical significance.
Of the 7 experimental subjects only one (subjects 1) showed reductions in their percent time sedentary. From pre- to post-intervention the mean percent time sedentary increased from 73.7% pre- to 77.4 post-intervention. This change was not statistically significant.
The following two figures (Figure 3.9 and Figure 3.10) display individual differences between pre- and post-intervention percent time in sedentary bouts for control (Figure 3.9) and experimental (Figure 3.10) group members.

**Figure 3.9 Pre- and Post-Intervention Percent Time in Sedentary Bouts for Control Group**

Of the 6 control subjects 3 (subjects 1, 3, and 5) showed reductions in their percent time in sedentary bouts. From pre- to post-intervention the mean percent time in sedentary bouts decreased from 65.4% pre- to 59.5% post-intervention. This change was not statistically significant.
Figure 3.10 Pre- and Post-Intervention Percent Time in Sedentary Bouts for Experimental Group

Of the 7 experimental subjects, 3 (subjects 1, 6, and 7) showed reductions in their percent time in sedentary bouts. From pre- to post-intervention, the mean percent time in sedentary bouts was relatively constant (65.4% pre- to 59.5% post-intervention), resulting in no statistical significance.
Chapter 3
Discussion

This investigation was designed to highlight an area of understudied research relating the combined and independent effects of physical activity and sedentary behavior to function and quality of life outcomes in older adults. While many studies have linked physical activity to functional preservation,\textsuperscript{11-12} few have considered possible correlations between sedentary behavior and function. Additionally, few studies have examined the efficacy of comprehensive (in)activity counseling (relating physical activity and sedentary behavior to function) to short-term behavioral adaptations. To examine these problems, this study addressed whether physical activity and sedentary behavior have independent impacts on functional and quality of life outcomes and whether brief, personalized (in)activity counseling can be used effectively to spur short-term changes in physical activity and sedentary behavior. The principal finding of this investigation indicated that while both physical activity and sedentary behavior are correlated with functionality, the deleterious functional effects of sedentary behavior may be ameliorated by higher levels of physical activity.

Physical Activity and Sedentary Behavior Effects on Function and Quality of Life

Analysis of specific aim 1 found that the study sample of older adults exhibited slightly higher levels of physical activity (MVPA) compared to a nationally represented sample (2003-2004 National Health and Nutritional Examination Survey).\textsuperscript{8} During the baseline 7-day monitoring period, older adults averaged 14.7 minutes of MVPA/day.
(55.7% of subjects < 10 min/day) compared to 10.8 minutes in the nationally represented NHANES sample. While both the NHANES and this investigation had identical daily average wear times of accelerometers (14.2 hours per day), and similar mean ages of participants (70.8 and 72.9 y.o. respectively), it is likely limited sample size and diversity resulted in this discrepancy. Whereas the NHANES study examined 1270 older adults above the age of 60 (84.0% non-Hispanic white), this investigation only monitored 61 subjects, 91.8% of whom where non-Hispanic white. Additionally, the mode by which participants were recruited for this study was likely to invoke a non-response bias from less active individuals. That is, individuals who engage in higher levels of physical activity were more likely to respond/show interest in the study, compared to their less active counterparts. Although the researcher attempted to recruit a sample with approximately a third of participants in high, moderate, and low activity categories, more physically active individuals (moderate-high) were overrepresented. Had a more diverse participant base been recruited, it is likely MVPA levels would more closely coincide with NHANES data.

Compared to a recent study by Dunlop et al. which supplied mean sedentary behavior data from a nationally represented older adult sample (n = 2286), slight variations were seen between sedentary trends. Despite using similar cut-points for objective measures (10 minutes <150 CPM = sedentary), Dunlop et al. found participants averaged 8.9 hours/day being sedentary while this investigation averaged only 8.29 hours/day (36 minutes less per day). Additionally, Dunlop et al found 63.4% of participants were sedentary for at least 9 hours per day, whereas this study found only 36.4% fell into this category. As with discrepancies in physical activity data compared to
nationally represented samples, it is likely sample size, diversity, and non-response bias of less active individuals influenced these sedentary measures. Despite minor variations in physical activity and sedentary behavior measures compared to nationally represented samples, the collected data upholds the trend that older adults are among some of the least active, more sedentary members of the population.\textsuperscript{8,10}

Bivariate correlations between physical activity and sedentary behavior and function and quality of life outcomes were first implemented to address specific aim 2. Although the majority of physical activity correlations followed general hypothesized patterns, some unexpected outcomes were observed. As was hypothesized, objectively measured physical activity was correlated with enhanced function. Individuals accruing higher levels of physical activity performed significantly better on measures of upper body strength, basic lower extremity function, advanced lower extremity function, aerobic endurance, agility, lower body flexibility, and upper body flexibility. The chair stand (assessing lower body strength) was the only functional fitness test not significantly correlated to physical activity levels. It may be that lower-body exercises remain an overlooked/undervalued component of strengthening routines (as 67.3\% of participants performed below their age-referenced norms\textsuperscript{13}) and that the gradual, age-induced decline in muscle mass\textsuperscript{1} exacerbates this oversight.

Unlike objective measures, self-reported functional measures were not significantly associated with physical activity. It is possible the response of a larger sample would alter these findings. Similar to self-reported functional measures, quality of life outcomes were not significantly correlated with physical activity as hypothesized. As a matter of fact, two out of three quality of life measures (mental health score and
satisfaction with life) were negatively insignificantly correlated with physical activity, meaning more physically active individuals experience lower mental health scores and satisfaction with life. Although it can only be speculated, one possible explanation for these unexpected outcomes can stem from examination of the responses to the sedentary behavior questionnaire participants completed at baseline. When asked about common leisure-time behavior, many participants reported engaging in high levels of pleasurable seated activity, such as computer time, socialization with friends, and completing puzzles. It is possible these stimulating sedentary activities act to preserve mental health and satisfaction with life, more so than physical activities. A study by La Rue et al. found 88% of American adults believe cognitive health can be improved, while 84% regularly engage in mentally stimulating activities (puzzles, arts, crafts, hobbies) to preserve mental function. Based on these statistics it is feasible to suggest older adults who partake in high quantities of stimulating sedentary behaviors would report higher mental health scores.

Correlations between sedentary behavior and objective and subjective measures of function revealed several unexpected outcomes. It was hypothesized individuals engaging in higher levels of sedentary behavior would experience decreased function, however this was not the case for any objective outcomes. As a matter of fact, sedentary behavior was significantly positively correlated with upper-body strength and agility, meaning individuals engaging in higher levels of sedentary behavior performed better on these activities. It is possible individuals engaging in high amounts of sedentary behavior rely on upper-body strength as a means to reach for and retrieve items while remaining in the seated position. It was also predicted individuals engaging in higher sedentary
behavior would have worse quality of life measures. As before with physical activity, this was not the case with objectively measured sedentary behavior, as it was positively correlated to the mental health score, likely confirming the leisure-activity preferences of this sample discussed above.

After implementing paired sample t-tests to evaluate between group differences of those meeting the aerobic component of the guidelines and those not, it was clear objective and subjective function are highly linked to physical activity levels. Statistically significant between group differences were found in all functional outputs except upper-extremity function and lower-body strength. Once again, the lack of statistically significant associations between physical activity and quality of life outcomes could relate to preferences for leisure-time activities discussed above.

The results of the hierarchical regression analyses evaluating the extent to which levels of physical activity and sedentary behavior predicted functional and quality of life outcomes revealed that only physical activity (both total and MVPA) predicted function. Sedentary behavior was controlled for in these analyses, suggesting that physical activity may serve a compensatory function. That is, the data suggest enhancing physical activity could lead to enhanced function in older adults regardless of amount of sedentary time. Testing the opposing assumption, no evidence was found supporting the idea that reducing sedentary time may lead to enhanced function once controlling for differences in physical activity levels.

These findings are contrary to recent findings from the Dunlop et al. study, where total time spent in sedentary behavior was significantly associated with disability. Possible explanations for this discrepancy may be attributed to the differences in types of
measures used. Dunlop et al. used objective measures to detail physical activity and sedentary behavior but only subjective measures of function. In the present study, objective measures of function were implemented as part of the functional fitness test battery. Additionally, the lack of associations in this study could stem from the small sample size and over-representation of relatively healthy and highly functioning older adults.

**Experimental Counseling**

Implementation of enhanced physical (in)activity counseling (experimental) compared to standard counseling (control) did not produce statistically significantly effects on any physical activity or sedentary behavior outcomes. Although members of the experimental group increased their daily average MVPA by a slightly higher degree compared to those receiving standard counseling, total physical activity favored the control. Additionally, the control group performed slightly (albeit non-significantly) better on all measures of sedentary behavior compared to the experimental group. The fact that both groups demonstrated the ability to slightly adjust their behavior following this brief counseling however is encouraging. The counseling sessions for both the experimental and control groups covered what would be considered essential elements of a personalized counseling session and appeared to spur changes in behavior for at least some subjects. Unfortunately, changes in motivation associated with the counseling were not measured directly so it is not possible to determine whether the counseling sufficiently motivated participants. It is also possible inclement weather conditions (substantial periods of ice and snow that occurred in-between the experimental session
and the two-week monitoring period that followed), could have contributed to the lack of significant improvement. Although there appears to be no added value from functional status counseling (the enhanced group), brief counseling sessions with personalized feedback have been shown effective in increasing activity and reducing inactivity in other studies.\textsuperscript{23} Although the counseling sessions included goal-setting and action-planning, combining the counseling with self-monitoring and provision of feedback through the follow-up period may have enhanced the effect of the intervention. Future studies should incorporate these elements in larger samples to further examine the efficacy of brief counseling interaction.

**Limitations**

The small sample size was a major limitation throughout this investigation, both regarding the goals of specific aims 1 and 2 as well as the counseling intervention (specific aims 3). The sample was also rather homogeneous. Future studies need to incorporate more diverse samples both with respect to demographics as well as functional abilities of the participants. It should also be acknowledged that there is an ongoing debate regarding the most appropriate cutoff values for classifying sedentary behavior based on accelerometer data. Although previously validated cut-points\textsuperscript{14} were used, it is possible that the results would be altered with a different set of cut-points. Accelerometers are also limited in their ability to distinguish inactivity. That is, it is impossible to differentiate between periods of when individuals are standing still versus sitting. To the extent that better functional outcomes may ensure from standing, it is possible that misclassification of standing time into sitting time may have contributed to the counterintuitive effects of sedentary behavior on some of the functional tests in this
study. Nonetheless, this study contributed to the underrepresented literature on associations between physical (in)activity and function in older adults.
Chapter 4

Conclusion

With the current older adult population expected to double by 2030, the need for understanding all aspects of functional preservation is greater now than ever before. While considering the limitations of this investigation, it is reasonable to conclude objective measures of function are more closely associated with physical activity than sedentary behavior. That is, this study indicated that potential negative functional effects of sedentary behavior can be ameliorated by engaging in physical activity at recommended levels. This study found no support for the notion that sedentary behavior is uniquely associated with functional outcomes, however, larger and more representative studies of older adults are needed to confirm this conclusion. Given the deleterious effects sedentary behavior has been shown to have on a range of health outcomes in large epidemiological studies and the fact that older adults are among the most sedentary population subgroups, intervention efforts to combat sedentary behavior in older adults are needed. From a functional status standpoint, this study suggests that the ideal approach may be to intervene by teaching older adults to substitute sedentary behaviors with more active pursuits, or find ways in which they can continue engaging in preferred sedentary activities in ways that are more active (such as substituting sedentary reading with listening to books on tape while walking, etc.). Although the brief counseling employed in this study did not produce significant changes in behavior at the group level, it was shown as feasible and was generally well received by the participants. Combining
physical (in)activity counseling with other behavioral methods shown effective to change behavior (e.g., self-monitoring, planning) may lead to more pronounced changes on physical (in)activity levels.
References


Appendix A

Pre-Experimental Material

1. FuSE Participant Recruitment Letter

Dear research volunteer,

My name is Brian Gross. I am currently a senior undergraduate student enrolled in the Schreyer Honors College. I am interested in intervention strategies designed to increase functionality and quality of life. I am contacting you because you indicated an interest in participating in research studies at Penn State.

The Kinesiology Aging and Psychology Lab (APL) would like to provide you with information on an upcoming study involving the effects of physical activity and inactivity (sedentary behavior) on function and quality of life.

We are looking for older adults willing to participate in a study involving survey completion, one or two lab visits to the APL with physical function assessments, and daily monitoring of physical activity using an accelerometer.

To be eligible, you must be between 60-85 years of age and capable of normal daily physical activity.

If you are interested in participating and believe that you may be eligible, please contact us at (814) 865-5606 or email us at aplresearch@psu.edu. You may also find more information about the study on our lab’s website at www.sites.psu.edu/aplab. We would be happy to answer any additional questions you may have.

For your much appreciated participation, we will provide you with a comprehensive assessment of your physical activity levels and functional status. Additionally, you will be entered into a lottery drawing for one of four $25 Walmart gift certificates.

Thank you for your interest and we look forward to hearing from you!

Sincerely,

Brian W. Gross - Principal Investigator

Advisor: Steriani Elavsky, Ph.D.
2. Telephone Recruitment/ Physical Activity Screening Script

*FuSE Telephone Screening Script*

“Hello, my name is [name], and I work as a [research assistant] at the Aging & Psychology Lab at the Department of Kinesiology at Penn State.”

“I would like to provide you with information about the Functional Usability Study for the Elderly (FUSE) that may be of interest to you. Do you have 5 to 10 minutes to talk right now?”

No → “When would be a good time for me to give you a call back?”

Yes → Follow prompt below:

“The study is being conducted by Brian Gross at the Penn State’s Department of Kinesiology under the supervision of Dr. Steriani Elavsky. We are looking for adults between the ages of 60-85 years of age willing to complete a mail-in survey, lab-based physical activity assessments, and willing to wear an activity monitor for period of either 7 or 21 days. All participants will complete one lab visit but some may be asked to complete a second visit.

The survey will be mailed to you and you will return it when you come in for your physical assessments. To take part in this research, you must be:

- Between the ages of 60-85 years of age
- Capable of normal daily physical activity

Does it sound like something you may be interested in?”

No → “Why are you not interested? (this is for our tracking purposes only)”

“Are you interested in receiving information about future research opportunities?” [If yes, obtain contact information]

“Although you are not interested in this study, we would like to ask you one additional question for tracking purposes only” [Follow prompt below, then thank participant]

Yes → Follow prompt below:

“Please answer the following question honestly.
Thinking about your physical activity over the past two weeks, on average, how many minutes per week would you say you engaged in physical activity of moderate to vigorous intensity? Moderate intensity activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.

0-30 minutes, 30-60 minutes, 60-90 minutes, 90 to 120 minutes, 120-150 minutes, or more than 150 minutes.

Thank you so much for your time, we would be happy to schedule your lab visit to complete the physical activity assessment. Before we do that, let me obtain your contact information.”

[schedule lab visit and double check contact information]

“Are you interested in receiving information about future research opportunities?”

“Next, we will mail you a packet that will contain the informed consent describing the study, baseline survey, pre-testing instructions and directions to our lab. Please review all documents and contact us if you have any questions. Complete the survey and bring with you along with the informed consent to your lab appointment on _____”(remind participant of date and time)

“Do you have any additional questions at this time?

Thank you for your participation and we look forward to seeing you on _______”
ADULTS 60-85 NEEDED FOR PHYSICAL FUNCTIONALITY AND HEALTH STUDY

Are you between the ages of 60-85?
Are you capable of normal daily physical activity?
The Penn State Aging and Psychology Lab needs your help!

The Penn State Aging and Psychology Lab is conducting a study to see the degree to which physical functionality can be maintained and better preserved across the lifespan.

We are looking for individuals of ALL activity levels (including low active adults)!

To learn more, contact the Kinesiology Aging & Psychology Lab at (814) 865-5606 or email us at aplresearch@psu.edu.
Are you between the ages of 60-85? Are you capable of normal daily physical activity? If yes, then you are eligible to participate in the Aging and Psychology Lab’s *Functional Usability Study for the Elderly* (FuSE). The purpose of this investigation is to measure the effects of physical activity and inactivity (sedentary behavior) on functional and quality of life outcomes in older adults between the ages of 65-85.

Volunteers interested in participating in this study will be required to make two visits to the Aging and Psychology Lab during which they will complete a series of questionnaires, undergo a brief physical activity assessment, and wear an accelerometer (motion detecting device) for a period ranging from 1-3 weeks. For your participation, the Aging and Psychology Lab will provide you with a comprehensive health assessment which you can use to monitor your current and future functional health. In addition, participants of this study will be placed in a random drawing to receive a $25 Walmart gift card (4 $25 gift card drawings will take place).

Interested? Please call us at (814) 865-5606 or e-mail us at aplresearch@psu.edu.
Appendix B

Lab Visit I Experimental Materials

1. Informed Consent

**Informed Consent Form for Social Science Research**

The Pennsylvania State University

**TITLE OF STUDY:** The Functional Usability Study for the Elderly (FuSE)

**INVESTIGATORS:**

*Brian Gross, Undergraduate Honors Scholar*
(Principle Investigator)
268B Recreation Bldg
University Park, PA 16802
bwg5101@psu.edu
(814) 865-7851

*Steriani Elavsky, Ph.D.*
(Advisor)
268B Recreation Bldg
University Park, PA 16802
sxe16@psu.edu
(814) 865-7851

1. **Purpose of the Study:** The purpose of this research study is to explore how physical activity and inactivity (sedentary behavior) impact functional and quality of life outcomes in older adults.

2. **Procedures to be followed:** You will be asked to complete a survey and wear an activity monitor (accelerometer) for 7 days. You will be also asked to complete one lab visit during which you will perform a series of physical tests assessing your strength (arm curl test and chair stand test), endurance (6 minute walk test), agility (8 foot up-and-go test), and flexibility (sit-and-reach test and back scratch test). A subset of participants will be selected to complete a second lab visit during which they will receive a personal consultation regarding their physical activity and will be asked to wear the activity monitor for additional 14 days.

3. **Discomforts and Risks:** There are no risks in participating in this research beyond those experienced in everyday life. Some of the questions are personal and might cause discomfort. The physical assessments involve activities such as walking, standing, lifting, stepping, and stretching. During the assessment you will be asked to perform within your physical comfort zone and never to push to a point of overexertion or beyond what you feel is safe. You can stop at any point. You will be instructed to notify the person monitoring your assessment if you feel any discomfort or experience any unusual physical symptoms such as shortness of breath, dizziness, tightness or
pain in the chest, irregular heartbeat, numbness, loss of balance, nausea, or blurred vision. The risks will also be minimized by using recommended testing procedures such as instructions to wear proper clothing and footwear, use of supervised warm-up and stretching prior to testing, and close supervision during testing with trained staff.

In the unlikely event you become injured as a result of your participation in this study, medical care is available. It is the policy of this institution to provide neither financial compensation nor free medical treatment for research-related injury. By signing this document, you are not waiving any rights that you have against The Pennsylvania State University for injury resulting from negligence of the University or its investigators.

4. **Benefits:** By participating in this study you will be providing important information about how physical activity and inactivity influence function and quality of life in older adults. This information will be useful in identifying the best targets for physical activity interventions for older adults. As part of the study, you will also receive personalized evaluation of your physical activity habits.

5. **Duration/Time & Location:** The completion of the survey takes approximately 30 minutes. You are asked to wear an activity monitor for either 7 or 21 days during all wake hours (except for when bathing, showering, swimming). This daily study also requires you to make at least one, if selected two, lab visits to the Kinesiology Aging & Psychology Laboratory at the Pennsylvania State University (26 Recreation Bld., University Park Campus).

6. **Statement of Confidentiality:** Your participation in this research is confidential. The data will be stored and secured at the Kinesiology Aging & Psychology Lab in locked file cabinets and password protected data files. The survey does not ask for any information that would identify who the responses belong to. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared because your name is in no way linked to your responses. The Pennsylvania State University’s Office for Research Protections and Institutional Review Board, and the Office for Human Research Protections in the Department of Health and Human Services may review records related to this project.

7. **Right to Ask Questions:** Please contact Brian Gross at (814) 865-5606 or Steriani Elavsky at (814) 865-7851 with questions or concerns about this study. You can also call these numbers if you feel this study has harmed you. If you have any questions, concerns, problems about your rights as a research participant or would like to offer input, please contact The Pennsylvania State University’s Office for Research Protections (ORP) at (814) 865-1775. The ORP cannot answer questions about research procedures. Questions about research procedures can be answered by the research team.

8. **Payment for participation:** There is no financial compensation for this study but each participant will receive personalized feedback on their physical activity levels. Additionally, all participants will be entered into a lottery drawing for one of four $25 Walmart gift certificates.

9. **Voluntary Participation:** Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusing to participate or withdrawing early from the study will involve no penalty or loss of benefits you would be entitled to otherwise.
You must be 60 years of age or older to take part in this research study. If you agree to take part in this research study and the information outlined above, please sign your name and indicate the date below.

__________________________________________           _________________
Participant Signature                     Date

__________________________________________           _________________
Person Obtaining Consent                 Date
3. Lab Visit I Recruited Participant Instruction Letter

The Pennsylvania State University
Aging and Psychology Lab
Brian Gross
268B Recreation Bldg
University Park, PA 16802
b wg5101@psu.edu
(717) 314-0092

Dear research participant,

Thank you for participating in the Functional Usability Study for the Elderly (FuSE). Within this envelope you will find three items which you will need to review/complete prior to your Functional Fitness Test date on Sunday, November 10 at 11:00 am.

The first item consists of instructions for Lab Visit 1: the Functional Fitness Test. This will take place at the Multisport Facility on the Penn State campus. These instructions will provide you with directions to the Multisport Facility, parking information, and an overview of the Functional Fitness Test.

The second item in this envelope is an informed consent form for participation in this study. You will find two copies of this form (please keep one for your records and bring the other with you to your next study visit). We ask that you please read the form carefully prior to signing. Upon your arrival to the Multisport Facility for your Functional Fitness Test, a member of the FuSE team will review the informed consent form with you and answer any questions you may have.

The third item in this envelope is a questionnaire packet. We ask that you read these questions carefully, answer truthfully, and respond to the best of your ability. This questionnaire will be collected with your informed consent form prior to your participation in the Functional Fitness Test on November 10.

Thank you for participating, and we look forward to seeing you on Sunday, November 10 at ___ in the Multisport Facility!

Sincerely,

The FuSE Team
Directions for Lab Visit 1: The Functional Fitness Test

**Lab Visit 1** will take place at the Penn State Multisport Facility located on the Penn State campus and will require you to participate in a comprehensive functional fitness test.

The Penn State Multisport Facility is located off of University Drive on Dauer Road (behind Bryce Jordan Center). Parking will be available in the lot at the end of Dauer Road as indicated below.

Upon arrival to the Multisport Facility, please park in the lot indicated above (parking is free on the weekend) and make your way to the main entrance of the building. Members of the FuSE team will be present to direct you to the testing area once you enter the facility.
Instructions for Lab Visit 1: The Functional Fitness Test

The Functional Fitness Test is a six-part, moderate-intensity physical activity assessment designed to mimic activities of daily living. During this assessment you will be completing an endurance test detailed in the following section, and these 5 functional tests:

- Chair Stand Test
- Sit-and-Reach Test
- Back Scratch Test
- Arm Curl Test
- 8 Foot Up-and-Go Test

Although the physical risks associated with the testing are minimal, the following reminders are important in ensuring your safety and helping you score the best you can.

1. Avoid strenuous physical activity for 1 or 2 days before the assessment.
2. Avoid excessive alcohol use for 24 hours before testing.
3. Eat a light meal 1 hour before testing.
4. Wear clothing and shoes appropriate for participating in physical activity (sneakers).
5. Bring a hat and sunglasses for walking outside and reading glasses (if needed) for completing forms.
6. Bring the Informed Consent and Assumption of Liability form and the Medical Clearance form, if required.
7. Inform the test administer of any medical conditions or medications that could affect your performance.

As part of your testing, you will also be asked to perform the aerobic endurance test below:

-6-minute walk test around a flat course to determine the distance you can cover in that time.

After you have determined that it is safe for you to participate in the tests (see Informed Consent form), you should practice the test you will be taking at least once before test day—that is, time yourself walking for 6 minutes. This will help you determine the pace that will work best for you on test day.
3. Lab Visit 1 Checklist

**Senior Functional Fitness Checklist: Lab Visit 1**

The following provides a comprehensive checklist of all proceedings during Visit 1 of the Functional Usability Study for the Elderly. Please check the line after each step has been completed.

**Pre-Visit 1:**

_____ Prepare gym for Senior Fitness Test. Make sure to have proper materials (stopwatch, folding chair, 18 inch ruler, dumbbells (5 lb and 8 lb), tape measure, cones, clipboards, and scoring sheets for recording test results).

**During Visit 1:**

_____ Greet participants. Check them for **proper attire** (i.e. sneakers).

_____ Review informed consent. Answer **any** questions.

_____ Following the review, **collect** each participants informed consent form.

_____ Collect each participants mailed questionnaire making sure it has been completed in its entirety. If aspects of the questionnaire still remain blank, ask participant to quickly fill this out.

_____ Walk participants through warm-up exercises outlined in the Senior Fitness Test Manual. (**head turns, head half circles, single-arm crossover, chest stretch, calf stretch, and hamstring stretch**).

_____ Run each participant through the Senior Fitness Test and **record** their results on scoring sheets as outlined in the Senior Fitness Test Manual, making sure they complete each of the following 6 stations: (place a checkmark following completion of each test)

- [ ] Chair Stand
- [ ] Arm Curl
- [ ] Height and weight measurement/Chair sit and reach
- [ ] Back Scratch
- [ ] 8 foot up-and-go
- [ ] 6 minute walk

_____ Following the Senior Fitness Test, place each scoring sheet in the designated manila folder labeled SCORING SHEETS.

_____ Provide participants with the activity monitor directions, making sure they know to (1) wear it for the entire week, (2) turn it off when they go to bed, (3) record in the log sheets provided when they turn it off, and (4) do not adjust their behavior due to wearing the activity monitor.

_____ Thank participants for coming and assisting in our research and express how they will all be receiving results from their fitness test today in the next 1-3 weeks (depending on the group they have been assigned to—control or experimental).

**Post-Visit 1:**

_____ Clean lab and gym area, returning materials to the APL lab.
## Scorecard: Senior Fitness Test

**Date:**

**Name:**

**M:**  

**F:**  

**Age:**  

**Ht:**  

**Wt:**  

### Test Item

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chair stand test (# in 30 sec)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>2. Arm curl test (# in 30 sec)</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>3. 2-minute step test (# of steps or 6-minute walk test (# of yds))</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>4. Chair sit-and-reach test (nearest 1/2 in.: +/-)</td>
<td></td>
<td></td>
<td>Right or Left (extended leg)</td>
</tr>
<tr>
<td>5. Back scratch test (nearest 1/2 in.: +/-)</td>
<td></td>
<td></td>
<td>Right or Left (over shoulder)</td>
</tr>
<tr>
<td>6. 8-ft up-and-go test (nearest 1/10 sec)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Copyright © 2013 by Roberta E. Rilli and C. Jessie Jones, Senior Fitness Test Manual, 2nd ed. (Champaign, IL: Human Kinetics). Commercial use is strictly prohibited without the express written permission of Human Kinetics, Inc.
5. Activity Monitor Directions

USING YOUR ACTIVITY MONITOR

We are asking you to wear the activity monitor for the entire duration of the study (7 days). Wearing one is easy to do, and most people forget they even have it on.

The activity monitor should be worn over your non-dominant hip (On top of or underneath clothes). The belt should be snug to prevent movement of the monitor.

The activity monitor should not be removed from its pouch, but if it does come out of the pouch, please replace it in pouch so that the arrow points downward towards the ground.

1. You should wear the activity monitor throughout the day. The only times you should NOT wear the monitor is while you shower, bathe, or swim.
2. **During the day**, the monitor is worn around your waist on your non-dominant hip, in line with your knee cap.
3. **During the night**, the monitor should be taken off and placed in a safe spot (such as a nightstand by your bed).
4. Please record the time when you are not wearing your monitor (when you took it off to sleep) in the activity log sheets provided in this packet.

Caring for the Activity Monitor

- Please take good care of the monitor and return it in good condition!
- Please be careful when using the bathroom, changing clothes, and doing similar activities so that the monitor does not drop or get hit against a hard surface.
- You will probably not need to clean the Activity Monitor. If it gets dirty, however, simply wiping it with a damp (not wet) rag should be sufficient.
- If after tightening your belt, there is a lot of excess belt hanging from the buckle, you may wish to trim it back. To do so, you should:
  - Make sure to leave about 3-4 inches excess for adjustment purposes.
  - Cut the belt evenly with a pair of scissors.
  - Seal the cut end of the belt with some clear nail polish to prevent fraying.
- You may use a safety pin or rubber band to tie up extra belt rather than cutting it if you prefer.
Replacing or Returning the Activity Monitor

After you have worn the Activity Monitor for one week, you will bring it back with you to your Lab Visit #2 (final) visit to the Aging and Psychology lab. During Lab #2 you may be asked to wear the monitor for an additional two week period.

If you notice the light on the monitor flashing (two times every 3 seconds), please contact us as your monitor will have to be replaced with a newly charged unit.

WHEN DO I START WEARING THE ACTIVITY MONITOR?

You will begin wearing the activity monitor after Lab Visit #1 where you will be completing the Senior Functional Fitness Test. Please keep the activity monitor and log in a safe place until your next lab visit (Lab Visit #2), approximately one week after the Senior Functional Fitness test.

START DATE & TIME:
______________________________

We will also be providing reminder phone calls!

HOW DO I RETURN THE ACTIVITY MONITOR?

Please bring the activity monitor back to the Aging and Psychology Lab (26 Recreation Building) prior to your Lab Visit #2—OR—have a member of the APL lab pick the monitor up from your home.

2nd Appointment DATE & TIME:
______________________________

Please remember your activity monitor and log at this appointment. If you need to change your appointment, please call our lab at: 814-865-5606

Activity Monitor Troubleshooting

If you are experiencing problems with your Activity Monitor or have questions, please contact our staff at 814-865-5606 or at aplresearch@psu.edu.
6. FuSE Comprehensive Questionnaire

Functional Usability Study for the Elderly

Comprehensive Questionnaire
**PART I:** The following questions ask about your ability to do specific activities as part of your daily routines. It may be the case that you do not do some of the activities at all. You can still answer these questions by assessing how difficult you think they would be for you to do on an average day.

Factors that influence the level of difficulty you may have include: pain, fatigue, fear, health conditions, or disabilities.

It is important to remember that the following questions ask how difficult the activity would be for you to do without the help of someone else, or the use of an assistive device (e.g. cane, walker). **Mark your answer by circling the appropriate number. Please respond truthfully and to the best of your ability.**

---

**How much difficulty do you have...**

1. Unscrewing the lid off a previously unopened jar without using any assistive devices.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
   None | A little | Some | Quite a lot | Cannot do |

2. Running ½ mile or more.

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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
   None | A little | Some | Quite a lot | Cannot do |

3. Using common utensils for preparing meals (e.g., can opener, potato peeler, or sharp knife).

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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
   None | A little | Some | Quite a lot | Cannot do |

4. Holding a full glass of water in one hand.

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<th>4</th>
<th>5</th>
</tr>
</thead>
</table>
   None | A little | Some | Quite a lot | Cannot do |
5. Walking a mile, taking rests as necessary.

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<tr>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>A little</td>
<td>Some</td>
<td>Quite a lot</td>
<td>Cannot do</td>
</tr>
</tbody>
</table>

6. Going up and down a flight of stairs outside, without using a handrail.

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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>A little</td>
<td>Some</td>
<td>Quite a lot</td>
<td>Cannot do</td>
</tr>
</tbody>
</table>

7. Ripping open a package of snack food (e.g. cellophane wrapping on crackers) using only your hands.

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<th>4</th>
<th>5</th>
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</thead>
<tbody>
<tr>
<td>None</td>
<td>A little</td>
<td>Some</td>
<td>Quite a lot</td>
<td>Cannot do</td>
</tr>
</tbody>
</table>

8. Pouring from a large pitcher.

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<th>3</th>
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<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>A little</td>
<td>Some</td>
<td>Quite a lot</td>
<td>Cannot do</td>
</tr>
</tbody>
</table>

How much difficulty do you have…

9. Getting into and out of a car/taxi.

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<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>A little</td>
<td>Some</td>
<td>Quite a lot</td>
<td>Cannot do</td>
</tr>
</tbody>
</table>

10. Going up and down 3 flights of stairs inside, using a handrail.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>A little</td>
<td>Some</td>
<td>Quite a lot</td>
<td>Cannot do</td>
</tr>
</tbody>
</table>
11. Picking up a kitchen chair and moving it, in order to clean.

1
None
2
A little
3
Some
4
Quite a lot
5
Cannot do

12. Using a step stool to reach into a high cabinet.

1
None
2
A little
3
Some
4
Quite a lot
5
Cannot do

13. Carrying something in both arms while climbing a flight of stairs (e.g. laundry basket)

1
None
2
A little
3
Some
4
Quite a lot
5
Cannot do

How much difficulty do you have…

14. Bending over from a standing position to pick up a piece of clothing from the floor.

1
None
2
A little
3
Some
4
Quite a lot
5
Cannot do

15. Walking around one floor of your home, taking into consideration doors, furniture, and a variety of floor coverings.

1
None
2
A little
3
Some
4
Quite a lot
5
Cannot do

-END PART I-

Please Proceed to Part II
**PART II:** The next part of this questionnaire refers to the time you spend sitting or lying down during a full day (24 hours). If you do not perform an activity, please write down ‘0’ (zero), meaning you spend no time during your average day engaging in this activity. **As before, please only consider your behavior during the past two weeks.**

**Please Note:** if you perform two activities at the same time, for example listening to music while knitting, please report only one of the two activities. You can choose which activity you report during this time.

---

On average, during a weekday (Monday - Friday), how many hours / minutes in a day (24 hours) do you ……

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.)</td>
<td>Take a nap on a chair or couch?</td>
</tr>
<tr>
<td>2.)</td>
<td>Read while being seated or lying down?</td>
</tr>
<tr>
<td>3.)</td>
<td>Listen to music while being seated or lying down?</td>
</tr>
<tr>
<td>4.)</td>
<td>Watch television, video or DVD</td>
</tr>
<tr>
<td>5.)</td>
<td>Perform a hobby while being seated, such as knitting, doing jigsaw puzzles or playing a musical instrument</td>
</tr>
<tr>
<td>6.)</td>
<td>Talk (in person or on the phone) with friends, family or acquaintances while being seated?</td>
</tr>
<tr>
<td>7.)</td>
<td>Sit at the computer for work or leisure</td>
</tr>
<tr>
<td>8.)</td>
<td>Perform sitting activities such as administrative tasks, writing a letter or having a meeting</td>
</tr>
<tr>
<td></td>
<td>Activity</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Sit in car, bus or train</td>
</tr>
<tr>
<td>10</td>
<td>Visit church or (movie) theater</td>
</tr>
<tr>
<td>11</td>
<td>Sit down while eating meals</td>
</tr>
</tbody>
</table>

-ENDED OF PART II-

Please Proceed to Part III
PART III: This questionnaire asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Please answer the following questions by checking the appropriate box. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

   [ ] Excellent
   [ ] Very good
   [ ] Good
   [ ] Fair
   [ ] Poor

   The following item regards activities you might do during a typical day. Does your health now limit you in these activities?

   If so, how much?

2. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling or playing golf

   [ ] Yes, Limited a lot
   [ ] Yes, Limited a little
   [ ] No, Not Limited at all

3. Climbing **several** flights of stairs

   [ ] Yes, Limited a lot
   [ ] Yes, Limited a little
   [ ] No, Not Limited at all

During the past 2 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? Please check Yes or No.

4. **Accomplished less** than you would like

   [ ] Yes
   [ ] No

5. Were limited in the **kind** of work or other activities

   [ ] Yes
   [ ] No
During the **past 2 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? Please check Yes or No.

6. **Accomplished less** than you would like

7. Didn't do work or other activities as **carefully** as usual

8. During the **past 2 weeks**, how much did pain interfere with your normal work (including both work outside the home and housework)? Check the appropriate answer.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
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These questions are about how you feel and how things have been with you **during the past 2 weeks**. For each question, please check the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 2 weeks**:

9. **Have you felt calm and peaceful?**

<table>
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<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>A Good bit of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
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10. **Did you have a lot of energy?**

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<tr>
<th>All of the time</th>
<th>Most of the time</th>
<th>A Good bit of the time</th>
<th>Some of the time</th>
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11. **Have you felt down-hearted and blue?**
12. During the past 2 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

A Good bit of the time

Some of the time

A little of the time

None of the time

13. The following questions ask some general questions about physical activity and sedentary behavior. Please answer the questions truthfully and to the best of your ability. It is important that we obtain honest answers.

These next questions are about strengthening the heart and lungs through exercise.

A. How many days a week do you think a person should exercise to strengthen the heart and lungs?

_________ days per week

B. For how many minutes do you think a person should exercise on EACH occasion so that the heart and lungs are strengthened?

_________ minutes
C. How fast do you think a person's heart rate and breathing should be to strengthen the heart and lungs?
   Do you think that the heart and breathing rate should be — (select one response)

   1. No faster than usual
   2. A little faster than usual
   3. A lot faster but talking is possible
   4. So fast that talking is not possible

D. What are the minimum aerobic requirements for accruing health benefits? (select all that apply)
   A. 100 minutes of moderate physical activity/week
   B. 150 minutes of moderate physical activity/week
   C. 50 minutes of vigorous physical activity/week
   D. 75 minutes of vigorous physical activity/week

E. Light strength training should be completed on a minimum of how many days per week?
   A. 1
   B. 2
   C. 3
   D. 4

   Please indicate your (dis)agreement with the following statements. Answer True or False to the best of your ability.

   E. It doesn’t matter for my health how long I sit during the day as long as I get enough physical activity.
      1. TRUE    2. FALSE

   F. I have a good understanding of how much physical activity I should be doing to achieve maximum health benefits.
      1. TRUE    2. FALSE

   G. I have a good understanding of what type(s) of physical activity I should be doing to achieve maximum health benefits.
      1. TRUE    2. FALSE
H. During a typical day, how much time spent sitting do you believe is too much and possibly detrimental to your health? (Fill in answer below)

_____ hours

-END OF PART III-

Please Proceed to Part IV
PART IV: Please indicate the extent to which you agree with each of the following items.

Please be as accurate and honest as you can and try not to let your answers to one question influence your answers to other questions.
There are no right or wrong answers.

1. In uncertain times, I usually expect the best.

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<th>5</th>
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<tbody>
<tr>
<td>strongly disagree</td>
<td>disagree</td>
<td>neutral</td>
<td>agree</td>
<td>strongly agree</td>
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2. It’s easy for me to relax.

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<tbody>
<tr>
<td>strongly disagree</td>
<td>disagree</td>
<td>neutral</td>
<td>agree</td>
<td>strongly agree</td>
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3. If something can go wrong for me, it will.

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<tr>
<td>strongly disagree</td>
<td>disagree</td>
<td>neutral</td>
<td>agree</td>
<td>strongly agree</td>
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4. I’m always optimistic about my future.

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<td>strongly disagree</td>
<td>disagree</td>
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5. I enjoy my friends a lot.

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<td>disagree</td>
<td>neutral</td>
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6. It’s important for me to keep busy.

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7. I hardly ever expect things to go my way.

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<td>disagree</td>
<td>neutral</td>
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8. I don’t get upset too easily.

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<td>disagree</td>
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9. I rarely count on good things happening to me.

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<td>strongly disagree</td>
<td>disagree</td>
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10. Overall, I expect more good things to happen to me than bad.

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<tr>
<td>strongly disagree</td>
<td>disagree</td>
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Please indicate the extent to which you agree with each statement listed below by using the scale which follows. Select the response that most closely matches your own, remembering that there are no right or wrong answers.

1 = strongly disagree
2 = disagree
3 = slightly disagree
4 = neither agree nor disagree
5 = slightly agree
6 = agree
7 = strongly agree
1. _____ In most ways my life is close to my ideal
2. _____ The conditions of my life are excellent
3. _____ I am satisfied with my life
4. _____ So far I have gotten the important things I want in life
5. _____ If I could live my life over, I would change almost nothing

-END OF PART IV-

Please Proceed to PART V

PART V: The following items are questions about your current level of physical activity and exercise.

Please indicate your response by circling the appropriate number so we can assess your current level of physical activity. Select the response that most closely matches your own, remembering that there are no right or wrong answers.

LEISURE TIME ACTIVITY:

1. Over the past 7 days, how often did you participate in sitting activities such as reading, watching TV, or doing handcrafts?

   1. NEVER (SKIP TO C2)
   2. SELDOM (1-2 DAYS)
   3. SOMETIMES (3-4 DAYS)
   4. OFTEN (5-7 DAYS)

   1a. What were these activities?

   ____________________________________________________________________________

   1b. On average, how many hours per day did you engage in these sitting activities?

   1. LESS THAN 1 HOUR
2. Over the past 7 days, how often did you take a walk outside your home or yard for any reason? For example, for fun or exercise, walking to work, walking the dog, etc.?

1. NEVER (SKIP TO C3)
2. SELDOM (1-2 DAYS)
3. SOMETIMES (3-4 DAYS)
4. OFTEN (5-7 DAYS)

2a. On average, how many hours per day did you spend walking?

1. LESS THAN 1 HOUR
2. 1 BUT LESS THAN 2 HOURS
3. 2-4 HOURS
4. MORE THAN 4 HOURS

3. Over the past 7 days, how often did you engage in light sport or recreational activities such as bowling, golf with a cart, shuffleboard, fishing from a boat or pier, or other similar activities?

1. NEVER (SKIP TO C4)
2. SELDOM (1-2 DAYS)
3. SOMETIMES (3-4 DAYS)
4. OFTEN (5-7 DAYS)

3a. What were these activities?

_________________________  ________________________

3b. On average, how many hours per day did you engage in these light sport or recreational activities?

1. LESS THAN 1 HOUR
2. 1 BUT LESS THAN 2 HOURS
3. 2-4 HOURS
4. MORE THAN 4 HOURS

4. Over the past 7 days, how often did you engage in moderate sport and recreational activities such as doubles tennis, ballroom dancing, hunting, ice skating, golf without
a cart, softball or other similar activities?

1. NEVER (SKIP TO C5)
2. SELDOM (1-2 DAYS)
3. SOMETIMES (3-4 DAYS)
4. OFTEN (5-7 DAYS)

4a. What were these activities?

_____________________________________________________

4b. On average, how many hours per day did you engage in these moderate sport and recreational activities?

1. LESS THAN 1 HOUR
2. 1 BUT LESS THAN 2 HOURS
3. 2-4 HOURS
4. MORE THAN 4 HOURS

5. Over the past 7 days, how often did you engage in strenuous sport and recreational activities such as jogging, swimming, cycling, singles tennis, aerobic dancing, skiing (downhill or cross country) or similar activities?

1. NEVER (SKIP TO C6)
2. SELDOM (1-2 DAYS)
3. SOMETIMES (3-4 DAYS)
4. OFTEN (5-7 DAYS)

5a. What were these activities?

_____________________________________________________

5b. On average, how many hours per day did you engage in these strenuous sport and recreational activities?

1. LESS THAN 1 HOUR
2. 1 BUT LESS THAN 2 HOURS
3. 2-4 HOURS
4. MORE THAN 4 HOURS

6. Over the past 7 days, how often did you do any exercises specifically to increase muscle strength and endurance, such as weights or pushups, etc.?
1. NEVER (SKIP TO C7)
2. SELDOM (1-2 DAYS)
3. SOMETIMES (3-4 DAYS)
4. OFTEN (5-7 DAYS)

6a. What were these activities?
_____________________________________________________

6b. On average, how many hours per day did you engage in these exercises to increase muscle strength and endurance?

1. LESS THAN 1 HOUR
2. 1 BUT LESS THAN 2 HOURS
3. 2-4 HOURS
4. MORE THAN 4 HOURS

HOUSEHOLD ACTIVITY:

7. During the past 7 days, have you done any light housework, such as dusting or washing dishes?
   1. NO  2. YES

8. During the past 7 days, have you done any heavy housework or chores, such as vacuuming, scrubbing floors, washing windows, or carrying wood?
   1. NO  2. YES

9. During the past 7 days, did you engage in any of the following activities?
   For each activity please circle NO or YES
   
   | Home repairs like painting, wallpapering, electrical work, etc.? | NO YES |
   | Lawn work or yard care, including snow or leaf removal, wood chopping, etc.? | NO YES |
   | Outdoor gardening? | NO YES |
   | Caring for another person, such as children, dependent spouse, or another adult? | NO YES |

WORK RELATED ACTIVITY:
10. During the past 7 days, did you work for pay or as a volunteer?

1. NO (SKIP TO END)  
2. YES

10a. How many hours per week did you work for pay or as a volunteer?

_________________________ hours.

10b. Which of the following categories best describes the amount of physical activity required on your job and/or volunteer work?

1. Mainly sitting with slight arm movements.  
(Examples: office worker, watchmaker, seated assembly line worker, bus driver, etc.)

2. Sitting or standing with some walking.  
(Examples: cashier, general office worker, light tool and machinery worker, etc.)

3. Walking, with some handling of materials generally weighing less than 50 lbs.  
(Examples: mailman, waiter/waitress, construction worker, heavy tool and machinery worker.)

4. Walking and heavy manual labor often requiring handling of materials weighing over 50 lbs.  
(Examples: lumberjack, stone mason, farmer, or general laborer.)

11. Would you consider the past 7 days to be a typical week as far as your physical activity level goes?

1. Yes, it was a typical week.

2. No, I performed more physical activity than I usually do.

3. No, I performed less physical activity than I usually do.

-END OF PART V-

Please Proceed to Background Information
**Background Information:** Now that you have completed this survey, please fill out the following demographic details. This will provide us with necessary information to describe our participant sample as a whole.

1. **Age: _____**

2. **Gender:** 1 Male / 2 Female

3. **Present Occupation:**
   1. Working as __________________
   2. Retired - since ___________ (please enter mo/yr)
   3. Retired on disability - since ___________ (please enter mo/yr)
   4. Not retired but unemployed

4. **Hours worked per week presently:** __________ hours

5. **Years in present occupation:** ____________ years

6. **Please enter the zip code of the area you reside in:** ____________

7. **Race:**
   1. White
   2. Black or African American
   3. Native American or American Indian
   4. Asian / Pacific Islander
   5. Other

7. **Ethnicity:**
   1. Hispanic or Latino
   1. Not Hispanic or Latino
8. Marital Status: What is your marital status? (Check one)

1. Single, never married
2. Married or domestic partnership
3. Widowed
4. Divorced
5. Separated
6. Not married but living in a shared household

9. Education: What is the highest degree or level of school you have completed? (Check one)

1. Less than 7th grade
2. Some high school, no diploma
3. High school graduate, diploma or the equivalent (for example: GED)
4. Some college credit, no degree
5. Trade/technical/vocational training
6. Associate degree
7. Bachelor’s degree
8. Master’s degree
9. Doctorate degree

10. Annual Household Income:

1. Less than $10,000
2. $10,000-25,000
3. $25,001-40,000
4. $40,001-65,000
5. $65,001 or greater
11. **General Health**: Please answer the following general health questions.

a. **Do you currently suffer from any health problems?**
   
   0  No  
   1  Yes  

   If yes, please list any chronic/acute conditions you have:

   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________

b. **Do you currently take any medications?**

   0  No  
   1  Yes  

   If yes, please list all medications you use:

   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________
   ______________________________________

- **END OF FUSE QUESTIONNAIRE**-

  Thank you for your participation

  *Please bring this completed questionnaire to your first lab session*
Appendix C

Lab Visit 2 Experimental Materials

1. Lab visit 2 Checklist

Senior Functional Fitness Checklist: Lab Visit 2

The following provides a comprehensive checklist of all proceedings during Visit 2 of the Functional Usability Study for the Elderly. Please check the line after each step has been completed.

Pre-Visit 2:

_____ Prepare personalized feedback report for participant

**During Visits 2:**

_____ Greet participants as they arrive and bring them to the consultation room 26 Recreation Building for their personalized feedback report.

_____ Provide the individual with their personalized feedback

_____ Walk individual through motivational-type review of findings presented in their personalized feedback report in accordance with the FuSE script

_____ Provide participants with the activity monitor directions, making sure they know to (1) wear it for the entire 2 week period, (2) turn it off when they go to bed, (3) record in the log sheets provided when they turn it off.

_____ Thank participants for coming and assisting in our research and express how they will all be receiving results from their fitness test during visit in 2 weeks if they have not already received it today (depending on the group they have been assigned to—control or experimental).
2. Feedback Script for Experimental and Control Subjects

Feedback Script: CONTROL GROUP

**Introduction:** (for a pair of interviewers)

Good morning/afternoon. My name is _______ and my name is ________. We are members of the FuSE team who evaluated your sedentary and physical activity behavior over the past week. At this time we would like to provide you with your comprehensive feedback report based on your ActiGraph data collected for the past week. The report is broken into 3 categories: physical activity feedback, sedentary behavior feedback, and action planning. We will start by evaluating your physical activity.

**Physical Activity Feedback:**

Name, based on your ActiGraph data you engaged in _____ minutes of light activity, ____ minutes of lifestyle activity, _____ minutes of moderate activity, _____ minutes of vigorous activity this past week. This gave you a total energy expenditure of ______ kcals/day on average.

For clarifying purposes, we are defining light activity as any activity where you are in motion, but you do not experience an increase in breathing rate. Moderate-intensity activity is defined as any activity that increases your breathing rate and heart rate above normal levels, but not to the point where your could no longer carry on a conversation. Vigorous activity is then defined as an activity that significantly increases your breathing and heart rate to the point where you could only talk for brief periods (staggered breathing).

When taking into account your moderate and vigorous activity, you engaged in ____ minutes of physical activity this week which gives you low/average/high activity rating. That is, based on the data, you engage in significantly less/slightly less/sufficient activity as recommended by the current physical activity guidelines for Americans. We will discuss this rating on the next page where we will explain these current physical activity standards.

I. Task/Maintenance Self-Efficacy:

- Are you surprised by the amount of time you spend in moderate intensity activity? Is it higher or lower than you expected?

- Did you feel that this past week was a typical week for you? Was it more or less active than a typical week?

  - If it was more active what caused this?

  - If it was less active what do you think caused this?
-Do you feel it would be important to integrate more physical activity into your life? (If they answer “yes,” have them explain why. If they answer “no,” also have them explain why)

**Case 1 (insufficient activity)**

-On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to make changes to your lifestyle by fitting in more moderate activity? (is the individual pre-contemplative, contemplative?)

-What do you think would be holding you back from increasing your physical activity? (Elicit barriers, refer to FACT SHEET on suggested strategies for overcoming)

**Example:**

Participant: “I would exercise more but my arthritis makes it too difficult and painful.”

Counsellor: “Yes, this is a common concern, however, physical activity should not be painful when performed at moderate levels. In fact, research shows that over time physical activity may reduce pain and fatigue in individuals with arthritis. The key is to choose the right activities and the right intensity. For example, walking is a great way to safely increase your physical activity. You may also want to choose water-based activities or a stationary bicycle to avoid joint pain. When it comes to intensity, you should be exercising at a level that allows you to talk in short sentences.

*Doing activity that requires moderate effort is safe for most people, but if you have a health condition such as heart disease, arthritis, or diabetes be sure to talk with your doctor about the types and amounts of physical activity that are right for you.*

-On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to increase your physical activity when confronted with the barriers we just discussed? [Refer to FACT SHEET on suggested strategies for overcoming]

**Case 2 (sufficient activity)**

-On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to maintain this level of activity? (Has the individual truly entered into the maintenance phase?)

-What do you think would be holding you back from maintaining your physical activity? (Elicit barriers, refer to FACT SHEET on suggested strategies for overcoming)

**Example:**

Participant: “Often times when the weather outside is poor I find that I am much less motivated to exercise or actually don’t exercise at all.”
Counselor: “This is one of the most common concerns for many individuals. With some thoughtful planning, however, there are many solutions available. Even if you prefer to generally exercise outdoors, finding some enjoyable indoor activities can help you stay active no matter what the weather. [ask about gym availability and suggest exploring classes]. Some individuals find it easier to engage in a home-based exercise program (i.e. work-out video).

On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to maintain your current level of physical activity when confronted with the barriers we just discussed?

[Refer to FACT SHEET on suggested strategies for overcoming]

II. Outcome Expectancies/ Risk Perception

-What are some of the other ways in which you would expect physical activity to positively impact your life?

Example Dialogue:

Participant: “I guess engaging in more physical activity could help manage my weight.”

Counselor: Listen to what participant says and then expand. “It is very true that physical activity along with some dietary modifications could help you manage your weight. Interestingly, research suggests that weight-related concerns provide only a short-lived motivation to be physically active. For long-lasting motivation, it is best to focus on more intrinsic payoffs of physical activity. For example, engaging in regular physical activity could make you feel less fatigued and more energetic throughout the day.......[refer to FACT SHEET on benefits and point out -- it can also increase your cognitive function. Losing cognitive function is a natural part of aging, however regular physical activity can help preserve and enhance this function.]

-How do you think that not engaging in enough physical activity could impact your life?

(Elicit risk perceptions and refer to FACT SHEET on health risks and benefits)

-Do you have any questions regarding your physical activity feedback before we discuss the walking activity subgroup of this section?

Walking Activity Feedback:

In addition to the various forms of activity collected by your ActiGraph, your steps per day were also recorded. On average, you took ______ steps per day, with step range from _____ to ______, meaning your lowest amount of steps per day was ______ and your highest was ______.

The average step count we have listed on your feedback report classifies you as ______ based on the activity classification chart to the right of the step box (point and show them this table). If you look further down the page you will see a line graph with the amount of steps you took on a daily
basis. Each point represents a day during the week and corresponds to the number of steps you took on this particular day. For instance on day 1 you took approximately ______ steps. On ____ out of 7 days you took over 10,000 steps which would place you in the active classification on the above chart (show them once more).

I. Task/Maintenance Self-Efficacy

-What do you think made a difference between the amount of steps you took on a daily basis?
-Does it surprise you that your step count is so variable/invariable?
-What do you think helped you to achieve more steps on days ____? [point out high days]
-What do you think made it more difficult to accumulate steps on days ____? [point out low days]

-On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to make small changes to your walking activity by simply increasing the number of steps you take daily?
-What strategies do you think you could use to help you with that?

[elicit some strategies and point out some additional ways - e.g., “… This could be as simple as parking the car farther away from the entrance to the grocery store or circling an extra block when going on walks…”].

Summary and review of Physical Activity Guidelines:
As we mentioned previously, your activity level puts you in the low/average/high category based on current Physical Activity Guidelines for Americans. These guidelines were established to provide recommendations for how much physical activity is needed to accrue optimal health benefits based on age. For the adult population aged 65 years and above, the guidelines are broken down into three different categories: aerobic, muscle-strengthening, and balance guidelines.

Aerobic Activity Guidelines: the aerobic portion of the guidelines suggests that you engage in 150 minutes of moderate-intensity activity per week or 75 minutes of vigorous-intensity activity per week.

What counts: the guidelines suggest in order for an activity to be considered, it must be performed in bouts lasting 10 minutes or longer.

-Some examples of moderate-intensity activity could include: fast walking, riding a bike on level ground with few hills, gardening, ballroom dancing, water aerobics, or tennis doubles.

- Some examples of vigorous-intensity activity could include: jogging or running, swimming laps, riding a bike quickly or on hills, aerobic dance, heavy gardening (constant digging and hoeing), hiking, and tennis singles.
Muscle-Strengthening Guidelines: the muscle-strengthening guidelines suggest that older adults should engage in muscle-strengthening on 2 or more days per week that work all major muscle groups (such as the legs, hips, back, chest, abdomen, shoulders and arms)

What counts: some examples of muscle-strengthening activities utilizing major muscle groups could include lifting weights (free weights or weight machines), working with resistance bands, using your own bodyweight for resistance (sit-ups, body squats), heavy gardening using digging, shoveling, and lifting motions, yoga.

Balance Guidelines: in addition to the aerobic and muscle-strengthening guidelines, the Guidelines suggest older adults should engage in balance activities on two or more days per week, especially if they are at risk for falling.

What counts: Balance activities could include things such as engaging in line drill activities such as front-and-backs, side-to-sides (demonstrate if they need further understanding), or yoga/pilates.

Transition: Are there any specific ways in which you feel that you are falling short relative to the physical activity guidelines? [give them opportunity to respond]....

At the end of today’s session, we’ll help you identify some simple steps that you can start taking now to help you get on your way towards the goals in the Guidelines.

Do you have any questions surrounding physical activity before we move to the review of your sedentary behavior?

Sedentary Behavior Feedback:

The second category of this feedback report relates to your sedentary behavior. Sedentary behaviors are activities that do not increase energy expenditure above resting levels such as sleeping sitting, lying down surfing the internet, watching television, and other forms of seated entertainment.

Name, based on your ActiGraph data from the last week you have spent an average of _____ hours in sedentary behavior. This includes the time you spent sitting and lying, and excludes your sleeping time. If you look to the pie chart on the top, left-hand corner of the page, you can see the percentage of the day you spent standing, lying, and sitting.

Researchers are only starting to understand how being sedentary impacts our health and although there are no official normative guidelines yet, research suggest that adults should strive to sit less than 8 hours per day. Based on this, your data suggest you are low/moderate/high sedentary.

That is, based on the data, you engage in significantly less/ slightly less /sufficient activity than/as would be recommended.

In addition to thinking about how long you sit, it is also recommended that you take a break in sedentary time at least every two hours. For example, if you are watching television for a prolonged period, it is suggested that at least every two hours you stand or walk around. Breaks in sedentary time can include: walking to the kitchen and pouring yourself a glass of water, standing/pacing around the room, or taking a quick stroll around the block.
Comparative Sedentary View: From your ActiGraph feedback, you are above average/ below average (show chart for visual comprehension). If you look to the right, you will see a line graph similar to that for your step count on page 1. During the past week it displays the amount of hours daily you spent engaging in sedentary behavior. The straight, horizontal line on the chart illustrates the average amount of time individuals of your age group spend engaging in sedentary behavior. As you can see you are above/at/below the average. During the past week you had a sedentary range of ______ to ______ meaning on your least sedentary day you spent ____ hours sitting and on your most sedentary day you spent _____ hours sitting.

I. Task/Maintenance Self-Efficacy:

- Are you surprised by the amount of time you spent sitting and lying on a daily basis? Is it higher or lower than you expected?

- Did you feel that this past week was a typical week for you?

- Was it more or less sedentary than a typical week?
  - If it was more sedentary what caused this?
  - If it was less sedentary what do you think caused this?

- On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to reduce/break-up your sedentary time during the day?

Case 1: Highly/Average Sedentary

On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to make changes to your lifestyle by decreasing your sedentary time? (sitting less than 8 hours a day and taking breaks in sedentary time at least every two hours?)

- What do you think would be holding you back from decreasing your sedentary time? (Elicit barriers, refer to FACT SHEET on suggested strategies for overcoming)

Example:

Participant: “I would sit less but many of the activities I like to do are sedentary. For example I love sitting and doing puzzles.”

Counselor: “Many of the activities that we enjoy doing on a daily basis are sedentary. We are not asking that you completely remove these activities from your daily routine, rather that you simply modify them. For example, if you enjoy doing puzzles, why not stand while you do them? Or if you feel you could not stand the entire time, how about for every half hour you sit doing the puzzle stand for a subsequent 10 minute period.”

Case 2: Low Sedentary

- On a scale from 1 (not at all confident) to 10 (very confident), how confident are you in your ability to maintain this level of sedentary activity? (sitting less than 8 hours a day and taking breaks in sedentary
time at least every two hours? )

--What do you think would be holding you back from maintaining this level of sedentary activity? (Elicit barriers, refer to FACT SHEET on suggested strategies for overcoming)

Example:
Participant: “Often times when I socialize with many of my friends they prefer to engage in sedentary activities. I feel like this could interfere with my ability to maintain my current sedentary activity level.”

Counselor: “This is definitely an issue that would require some careful attention. You are right that we are often times conditioned to be sedentary when we socialize. Perhaps suggesting less sedentary activities or replacing them with active alternatives could be an effective strategy for combating this issue. For example, perhaps once a week you could ask your friends to go on a walk rather than staying in and being sedentary. Not only would this still allow you be remain sociable, you could also be cutting back on your sedentary time.”

II. Outcome Expectancies/Risk Perception

Although you may be familiar with the positive effects increasing physical activity can have on your health, you may not be familiar with the positive effects of decreasing sedentary behavior. Recent research has suggested that sedentary behavior negatively impacts health regardless of how much physical activity one engages in. This means, without even considering physical activity levels, one could experience benefits or detriments to their health based solely on their sedentary behavior. Reducing your daily sedentary time can have numerous benefits such as:

- leaving you more energized throughout the day
- improving your mood
- research suggests that sitting less can improve your metabolism, potentially lowering your risk of developing metabolic complications including diabetes
- people who sit less also tend to have longer lifespans
- some researchers also believe that sitting less can help you lose or manage weight

(REFER TO FACT SHEET)

Transition: Are there any specific ways in which you feel that you are falling short relative to the guideline of sitting for less than 8 hours per day? [give them opportunity to respond]....In the final phase of today’s session, we will help you identify some simple steps that you can start taking now to help you get on your way towards the goals in the Guidelines.

Do you have any questions surrounding your sedentary behavior before we move onto the action planning section?

Action-Planning:

Name, after hearing your results and feedback, what are your thoughts about your physical activity levels?
- Are you pleased with your current physical activity and sedentary levels?
- Were you surprised by what we found?

**Case 1**
- Was any of the feedback concerning to you?
- Fortunately, there are many opportunities to take small steps toward change. Even small changes to your everyday routines can have a long-lasting impact on your health.

**Case 2**
- Sounds like you are on your way to an active lifestyle. Even if you are happy with what we have discussed, the key to staying healthy is to maintain your current physical activity levels and continue finding ways to keep your sedentary time low.

- How do you think you can decrease your sedentary time throughout the day? *Write down three concrete strategies...* [if they can’t think of anything, suggest a few strategies – be mindful of participants’ lifestyle, circumstances and preferences – decision making should be up to the participants, you are there to assist them in formulating effective strategies]
- What strategies could you incorporate on a daily basis or what activities can you engage in to increase your physical activity? *Write down at least three concrete strategies* [assist if necessary]
- We would like to make copies of your goals. [copy their action planning sheet]
- For the next two weeks, we would like you to keep these goals in mind and incorporate them into your daily activities. We will continue monitoring your physical activity for the next two weeks.
- Do you have any questions surrounding the action-planning goals you just made? (Give them a chance to respond and address their questions)
- Do you have any final questions surrounding anything we covered in this feedback session today?

Thank you very much for coming in and discussing your feedback report. We hope you found this session informative and beneficial.

[PROVIE A NEW ACTIVITY MONITOR AND BRIEFLY REVIEW INSTRUCTIONS]

Have a good morning/afternoon.
Feedback Script: EXPERIMENTAL GROUP

The experimental group will be receiving the same counseling as above. In addition, they will be provided with functional fitness feedback based on their performance in the Senior Functional Fitness Test (FFT). Because of this added component, the introduction will differ as follows.

Introduction: (for a pair of interviewers)

Good morning/afternoon. My name is _______ and my name is ________. We are members of the FuSE team who evaluated your sedentary and physical activity behavior over the past week. At this time we would like to provide you with your comprehensive feedback report based on the ActiGraph data for the past week as well as your functional performance during the Senior Functional Fitness Test. The report is broken into 4 categories: physical activity feedback, sedentary behavior feedback, functional fitness feedback, and action-planning. We will start by evaluating your physical activity.

Functional Fitness Feedback:

For the third component of this feedback report we assessed your functional fitness levels. The following information is based upon your performance in the Senior Functional Fitness Test.

I. Lower Body Strength

Name, your score on the chair stand was ____ meaning you completed ___ chair stands within the allotted 30 second time limit.

-This score places you in the _____ percentile for LOWER BODY STRENGTH for your age group.

-The average number of stands completed by men/women within your age group was ____.

II. Physical Agility

Name, your score on the 8-foot up-and-go was ____ meaning you completed one repetition within this time period.

-This score places you in the _____ percentile for AGILITY for your age group.

-The average time required to complete the 8-foot up-and-go by men/women within your age group was ____.

III. Upper Body Strength

Name, your score on the arm curl test was ____ meaning you completed ___ arm curl repetitions within the 30 second testing period.

-This score places you in the _____ percentile for UPPER BODY STRENGTH for your age group.

-The average number of arm curls completed by men/women within your age group was ____.

IV. Endurance
Name, your score on the 6-minute walk test was ____ meaning you walked ____ meters during the 6 minute time period.

- This score places you in the _____ percentile for ENDURANCE for your age group.
- The average distance covered by men/women within your age group was _____.

V. Upper Body Flexibility

Name, your score on the back scratch test was ____ meaning your hands reached/overlapped____ inches behind your back.

- This score places you in the _____ percentile for UPPER BODY FLEXIBILITY for your age group.
- The average distance reached by men/women within your age group was ____.

VI. Lower Body Flexibility

Name, your score on the chair sit-and-reach test was ____ meaning your hands reached/overlapped____ inches towards the toe of your shoe.

- This score places you in the _____ percentile for LOWER BODY FLEXIBILITY for your age group.
- The average distance reached by men/women within your age group was ____.

- In general, the best way to improve/maintain your function is to increase/maintain your physical activity and limit sedentary behavior. Performing the recommended amount of physical activity (that we discussed just a few moments ago) results in improved functions and has been associated with more years of functional independence, lower disability rates, and better quality of life.

- Based on the results we just reviewed, which areas of function are you happy with and which areas of function do you think you would like to improve? [listen and focus feedback on appropriate functional outcomes]

- Yes, working on ________ may be a good idea given your score…..

[refer to FACT SHEET on functional outcomes and provide suggestions for improvement]

[FIRST always emphasize striving to meet guidelines or work towards them and limiting sedentary time, then move to specific suggestions for exercises]

PROCEED TO ACTION PLANNING

Benefits of Physical Activity

To see the benefits of physical activity, you should engage in **150 minutes** (2 hours and 30 minutes) of moderate activity, or **75 minutes** (1 hour and 15 minutes) of vigorous activity per week.

Aerobic activities should be completed in bouts of 10 minutes per session.

You should also engage in muscle strengthening activities that are moderate or high and engage all muscle groups 2 or more times per week.

**Balancing exercises** should be completed regularly, especially if there is a risk of falling.

Older adults with chronic conditions should understand whether and how their conditions affect their ability to do regular physical activity safely.

**Benefits of Meeting Physical Activity Guidelines**

- Lower risk of early death
- Lower risk of coronary heart disease
- Lower risk of stroke
- Lower risk of high blood pressure
- Lower risk of adverse lipid profile
- Lower risk of type 2 diabetes
- Lower risk of metabolic syndrome
- Lower risk of colon cancer
- Lower risk of breast cancer
- Prevention of weight gain
- Weight loss, particularly when combined with caloric intake
- Improved cardiorespiratory and muscular fitness
- Prevention of falls
- Better cognitive function
Barriers of Physical Activity
and ways to overcome them

• Lack of knowledge, or not knowing of Physical Activity
  • Walking is sufficient Physical Activity,
  • Take an exercise class, or ask an employee at the gym to teach you different types of exercises
• I don’t have a gym near by
  • Walking around the neighborhood is just as sufficient,
  • Start a carpool with friends and family to go to the gym together
  • Buy a set of inexpensive weights and a mat to do exercises at home
• I don’t have enough time to exercise
  • Block 30 minutes of your day, or 10 minutes 3 times a day to fit in exercise
  • Park farther away in parking lots, or take the stairs (if able)
  • Plan social events with family and friends that incorporate exercise
• I don’t like to exercise
  • Spend time doing activities that you love like gardening, playing with your grandchildren, swimming, yoga, different types of dance, etc.
  • Also, you could sign up for multiple classes to find what you enjoy, and doesn’t seem like too much work
• Fear of injury
  • Always warm up before you begin to exercise, and cool down and stretch after exercise.
  • Listen to your body accordingly, if you are in pain then stop
• Weather
  • Go window shopping at the mall, or find an indoor work out like cycling, dance, etc.
4. Personalized Feedback Session Materials: Sedentary Behavior Fact Sheet

**SEDENTARY BEHAVIOR**

WHY SITTING TOO LONG IS A BAD THING

---

### Risks from Sitting Too Much

- Sitting for 8 hours in one day, or even just sitting for three hours without a break can adversely affect your health.
- Watching TV is the worst type of Sedentary behavior to engage in.
  - It can increase your risk of diabetes by 23%, and heart disease by 14%.
- When working, playing board games, or reading your risk of obesity by 5% and diabetes by 7%.

### Benefits of Decreasing Sedentary time

- Just taking a four minute break every two hours can reduce the negative effects from sitting and increase physical activity.
- You can add 2-3 years on your life if you spend less than 5 hours a day sitting
  - Watch TV for less than 2 hours a day
  - Engage in other sitting behaviors for 3 hours per day

### Overcoming Barriers

- At work, I have to sit for 5-9 hours a day
  - Buy an exercise ball to use instead of a desk chair, or you can alternate using the two
  - Take four minute breaks every two hours
    - Stretch your legs
    - Walk around the office
    - Grab some water
    - Instead of emailing a co-worker, go talk to them
- When watching TV at home
  - Clean during commercial breaks
  - Spend commercial breaks standing, or doing simple exercises
  - Arthritis, or other health problems that make exercising or standing for a long time difficult
    - Find an exercise that improves muscle strength and joint flexibility, like yoga, so these problems will be more manageable.
  - Plan social gatherings around physical activity, instead of sedentary activities
5. Personalized Feedback Session Materials: Functional Outcomes

**Functional Outcomes**

**Flexibility**

- **Upper Body**
  - Personal training program
  - Include stretching exercises

- **Lower Body**
  - Include flexibility exercises

**Endurance**

- Include aerobic activities
  - Personalized walking plan

**Strength**

- Include strength training exercises
  - Personalized weightlifting program

**Physical Agility**

- Include agility exercises
  - Personalized balance training

**How to Improve**

- Regular participation in all activities
- Consistency in training
- Gradual progression in intensity

**Why Improve?**

- Improved mobility
- Increased strength and endurance
- Better overall health and well-being

**Personalized Training Plan**

- Customized plan based on individual needs
- Regular feedback sessions
- Adjustments made as needed

**Physical Activity Feedback:** How active are you?

- Light Activity: 768 mins/week
- Lifestyle Activity: 273 mins/week
- Moderate Activity: 118 mins/week
- Vigorous Activity: 1 mins/week
- Energy Expenditure: 1085.9 kcal/week

You engage in **120 minutes of moderate intensity activity per week**, and ample light and lifestyle activity.

**ACTIGRAPH Data:** Your steps in 1 Week

- **Average Steps Per Day:** 5,965 steps/day
- **Step Range:** 4,630-8,469
  - Lowest Day: 4,630 steps
  - Highest Day: 8,469 steps

**Activity Classification**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Steps Per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly Active</td>
<td>12,500</td>
</tr>
<tr>
<td>Active</td>
<td>10,000-12,499</td>
</tr>
<tr>
<td>Somewhat Active</td>
<td>7,999-8,999</td>
</tr>
<tr>
<td>Low Active</td>
<td>5,000-7,499</td>
</tr>
<tr>
<td>Sedentary</td>
<td>&lt;5,000</td>
</tr>
</tbody>
</table>

On 3 out of 5 days you took over 5,000 steps! Could you increase this number?

*The accelerometer only accounts for days you wore the monitor for 10 hours.*
Do You Meet the 2008 Physical Activity Guidelines?

Ms. _____
Based on your ActiGraph data you achieve high levels of light intensity, and moderate amounts of moderate-intensity activity. To increase your amount of moderate-intensity activity, try increasing your light activities to bouts of at least 10 minutes. This change should drastically increase your amount of moderate-intensity activity, helping you meet the guidelines below.

So, what are the 2008 Physical Activity Guidelines?

**Aerobic Activity Guidelines**
2 hours and 30 minutes (150 minutes) of moderate-intensity aerobic activity every week.

-OR-
1 hour and 15 minutes (75 minutes) of vigorous-intensity aerobic activity every week

**What counts?**

Moderate-Intensity Activity: Walking fast, water aerobics, riding a bike on level ground, tennis (doubles), ballroom dancing

Vigorous-Intensity Activity: jogging or running, swimming laps, riding a bike fast or uphill, tennis (singles), aerobic dance, hiking uphill

**Muscle-Strengthening Guidelines**
Elder adults should engage in muscle-strengthening activities on 2 or more days per week that work all major muscle groups (legs, hips, back, chest, abdomen, shoulders, and arms)

**What counts?**
- Lifting weights (Free weights, weight machines)
- Working with resistance bands
- Using your own body weight for resistance (i.e. sit-ups, body squats)
- Heavy gardening (i.e., digging, shoveling)
- Yoga

**Balance Guidelines**
Elder adults who are at risk for falling are also encouraged to engage in balance activities 2 or more days per week.

**What counts?** backward walking, heel walking, sideways walking, toe walking, and standing from a sitting position
**Sedentary Behavior Feedback:** How much do you sit?

**What is sedentary behavior?**

Sedentary behaviors are activities that do not increase energy expenditure above resting levels such as sleeping, sitting, lying down, surfing the Internet, watching television, and other forms of seated entertainment.

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**Comparative Sedentary View**

The line graph below displays your weekly sedentary time (blue line) compared to the average constant daily sitting time (9.54 hours) for your age group (red line).

- **Minimum Sitting Day**: 9.1 hours
- **Maximum Sitting Day**: 12.4 hours
Lights ... camera ... ACTION PLANNING!

Now that you have had a chance to review your feedback report, here is your chance to plan some strategies. Below, create 3 strategies for changing (or maintaining) your current physical activity and 3 strategies for changing (or maintaining) your current sedentary levels.

<table>
<thead>
<tr>
<th>Physical Activity Strategies</th>
<th>Sedentary Behavior Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy 1</strong></td>
<td><strong>Strategy 1</strong></td>
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<td><strong>Strategy 2</strong></td>
<td><strong>Strategy 2</strong></td>
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<tr>
<td><strong>Strategy 3</strong></td>
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</table>

*Physical Activity Feedback*: How active are you?
- Light Activity: 1199 mins/week
- Lifestyle Activity: 172 mins/week
- Moderate Activity: 10 mins/week
- Vigorous Activity: 0 mins/week
- Energy Expenditure: 971.9 kcals/week

**You engage in 10 minutes of moderate intensity activity per week, and ample light and lifestyle activity.**

**AVERAGE Steps Per Day:**
- 2,256 steps/day
- **STEP RANGE:** 1548-3234
- Lowest Day: 1,548 steps
- Highest Day: 3,234 steps

**Activity Classification**
- Highly Active: 13,500
- Active: 10,000-12,499
- Somewhat Active: 7,500-9,999
- Low Active: 5,000-7,499
- Sedentary: <5,000

**ActiGraph Data**: Your steps in 1 Week

*On 0 out of 7 days you took over 5,000 steps. Could you increase this number?*

*The accelerometer only accounts for days you wore the monitor for 10 hours.*
Do You Meet the 2008 Physical Activity Guidelines?

Mr. _____,
Based on your ActiGraph data you achieve high levels of light intensity, and lifestyle activity. To increase your amount of moderate-intensity activity, try increasing your light activities to bouts of at least 10 minutes. This change should drastically increase your amount of moderate-intensity activity, helping you meet the guidelines below.

So, what are the 2008 Physical Activity Guidelines?

Aerobic Activity Guidelines
2 hours and 30 minutes (150 minutes) of moderate-intensity aerobic activity every week.
-OR-
1 hour and 15 minutes (75 minutes) of vigorous-intensity aerobic activity every week

What counts?
Moderate-Intensity Activity: Walking fast, water aerobics, riding a bike on level ground, tennis (doubles), ballroom dancing
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Elder adults should engage in muscle-strengthening activities on 2 or more days per week that work all major muscle groups (legs, hips, back, chest, abdomen, shoulders, and arms)

What counts?
- Lifting weights (Free weights, weight machines)
- Working with resistance bands
- Using your own body weight for resistance (i.e. sit-ups, body squats)
- Heavy gardening (i.e., digging, shoveling)
- Yoga

Balance Guidelines
Elder adults who are at risk for falling are also encouraged to engage in balance activities 2 or more days per week.

What counts? backward walking, heel walking, sideways walking, toe walking, and standing from a sitting position
**Sedentary Behavior Feedback: How much do you sit?**

**What is sedentary behavior?**
Sedentary behaviors are activities that do not increase energy expenditure above resting levels such as sleeping, sitting, lying down, surfing the Internet, watching television, and other forms of seated entertainment.

- **Standing:** 11% (2360)
- **Lying:** 11% (2370)
- **Sitting:** 27% (211210)
- **Off:** 52% (41710)

On average, you spend about 7 hours and 52 minutes sitting a day.

Mr. _____, based on your ActiGraph data you fall into the low-sedentary category.

<table>
<thead>
<tr>
<th></th>
<th>Low Sedentary</th>
<th>Moderately Sedentary</th>
<th>High Sedentary</th>
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</thead>
<tbody>
<tr>
<td>&lt;8 hours per day</td>
<td>8-10 hours per day</td>
<td>&gt; 10 hours per day</td>
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</tbody>
</table>

**Comparative Sedentary View**
The line graph below displays your weekly sedentary time (blue line) compared to the average constant daily sitting time (9.54 hours) for your age group (red line).

- **Minimum Sitting Day:** 6.7 hours
- **Maximum Sitting Day:** 11.0 hours
Functional Fitness Feedback: How did you perform?

1) Chair Stand
You stood 13 times in 30 Seconds.
Your Score: 13 stands
Percentile Rank: 45th

2) 8-foot up-and-go
Your Score: 5.1 seconds
Percentile Rank: 66th

3) Arm Curl
Your Score: 17 curls
Percentile Rank: 55th

You performed just below average on the chair stand for your age group, with a total of 13 stands in 30 seconds, placing you in the 45th percentile.

You performed above average on the 8-foot up-and-go, with a time of 5.1 seconds, placing you in the 66th percentile.

You performed just above average on the arm curl, with a total of 17 arm curls in 30 seconds, placing you in the 55th percentile.
**Functional Fitness Feedback:** How did you perform?

4) **6-minute walk**
   - Your Score: 500 meters
   - Percentile Rank: 34th
   - You performed below average on the 6-minute walk with a total of 500 meters, placing you in the 34th percentile.

5) **Back Scratch**
   - Your Score: -10.2 cm
   - Percentile Rank: 17th
   - You performed below average on the back scratch with a reach of -10.2 centimeters, placing you in the 17th percentile for your age group.

6) **Chair sit-and-reach**
   - Your Score: 5.1 cm
   - Percentile Rank: 92nd
   - You performed above average on this test, with a reach of 5.1 cm, placing you in the 92nd percentile.
Lights ... camera ... ACTION PLANNING!

Now that you have had a chance to review your feedback report, here is your chance to plan some strategies.
Below, create 3 strategies for changing (or maintaining) your current physical activity and 3 strategies for changing (or maintaining) your current sedentary levels.

### Physical Activity Strategies

- **Strategy 1**
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- **Strategy 2**
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- **Strategy 3**
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### Sedentary Behavior Strategies

- **Strategy 1**
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- **Strategy 2**
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- **Strategy 3**
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  - 
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  - 
ACADEMIC VITA

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The Pennsylvania State University, University Park, PA
College of Health and Human Development
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Minor in Neuroscience
Schreyer Honors College- Honors in Kinesiology
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Thesis Supervisor: Steriani Elavsky, Ph.D.

Honors and Awards
Health and Human Development Alumni Recognition Award for Student Excellence, 2014

Association Memberships/Activities
Phi Eta Sigma National Honor Society, 2010-2014
Pennsylvania State University Aging and Psychology Lab Research Assistant, 2013-2014

Related Experience
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Supervisor: Cory Bowman, CSCS
Summer 2013